

# SELECTED

# % WATER RESOURCES ABSTRACTS



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# WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center Office of Water Resources Research, U.S. Department of the Interior PACIFIC POWER & LIGHT



**VOLUME 5, NUMBER 10**MAY 15, 1972

W72-05279 -- W72-05878

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

#### FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

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## SELECTED WATER RESOURCES ABSTRACTS

#### 02. WATER CYCLE

#### 2A. General

HYDROLOGICAL, HYDRAULIC, SOIL MECHANICAL AND METEOROLOGICAL ASPECTS OF MODELS DEVISED FOR DETER-MINING THE DEGREE OF PROTECTION OF-FERED BY FLOOD LEVEES, National Water Authority, Budapest (Hungary).

International Association of Scientific Hydrology Bulletin, Vol. 16, No. 3, p 45-49, September 1971. 3 fig. 2 ref.

Descriptors: \*Flood protection, \*Levees, \*Water levels, \*Waves (Water), Mathematical models, Seepage, Floods, Statistics, Erosion, Scour.

The degree of protection at any cross-section of a levee is defined as the minimum flood exposure which the levee is just capable of withstanding which the levee is just capacie of withstanding without special protective measures. The degree of protection offered by a levee section can be found by statistical analysis. For finding the minimum flood exposure the potential causes of failure must be investigated. These are influenced by the shape of the flood hydrograph, geological and soil mechanical factors, and by wave action, which are controlled by topography and the meteorological conditions. Mathematical models are given for the analysis of each of the four phenomena. The mathematical model serving the determination of the flood exposure critical for wave action is presented as an example. (Knapp-TISGS) W72-05332

DEVELOPMENT OF HYDROLOGIC INVESTIGATIONS IN THE USSR (RAZVITIYE GIDROLOGICHESKIKH ISSLEDOVANIY V

SSSR). State Hydrologic Institute, Leningrad, USSR. Gosudarstvennyi Gidrologicheskii Institut, Lenin-grad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 171, Sokolov, A. A., editor, 1971. 104 p.

Descriptors: \*History, \*Reviews, \*Investigations, \*Hydrologic aspects, \*Hydrologic cycle, Water resources, Water balance, Water utilization, Water supply, Water storage, Water chemistry, Water management (Applied), Channel morphology, Runoff, Hydrogeology, Climatology, Meteorology, Reclamation, Forecasting, Organizations.

ganizations.
Identifiers: \*USSR, \*State Hydrologic Institute,
Number of the Hydrology of th Engineering hydrology, Mineralization.

This collection of 11 papers contains reports presented at the anniversary celebrations of the Academic Council of the State Hydrologic Institute on the occasion of the 50th anniversary of the founding of the establishment. Examination of the history and activities of the Institute over the the history and activities of the institute over the last 50 years is accompanied by papers on such general topics as: (1) water resources and water balance of the USSR (K.P. Voskresenskiy); (2) hydrology and water management of the USSR (S.N. Kritskiy and M.F. Menkel'); (3) development of experimental investigations in hydrology ment of experimental investigations in hydrology (A.I. Chebotarev); (4) development of reclamation practices in the USSR and problems of Soviet hydrology (T.L. Varkhotov and G. L. Ignatyuk); (5) formulation of a doctrine on runoff (D.L. Sokolovskiy); (6) problems of world water balance (M.I. L'vovich and A.A. Sokolov); (7) hydrochemical investigations in the USSR (O.A. Alekin); (8) development of a hydrological forecast and information service for the USSR (Ye. G. Popov); and (9) theoretical investigations of channel processes by the State Hydrologic Institute (I.V. Popov and N. Ye. Kondrat'yev). The collection is designed for use by specialists in hydrology, hydraulic engineering, and geography as well as by undergraduate and graduate students in these respective fields. (Josefson-USGS) W72-05353

WATER BALANCE OF RIVER BASINS (VOD-NYY BALANS RECHNYKH VODOSBOROV), Belorussian Water Research Inst., Minsk (USSR). Dept. of Hydrological Research.

Gidrometeoizdat, Leningrad, 1971. 304 p.

Descriptors: \*Water balance, \*Hydrologic budget, \*River basins, \*Watersheds (Basins), Large watersheds, Small watersheds, Agricultural watersheds, Crops, Precipitation (Atmospheric), watersheds, Crops, Precipitation (Atmospheric), Snow, Streamflow, Runoff, Water storage, Evaporation, Percolation, Water year, Seasonal, Land reclamation, Mathematical studies, Methodology.

dentifiers: \*USSR, \*Belorussia, \*Europe, Neman River, Water-balance method, Cybernetics.

This monograph consisting of 7 chapters contains a survey of the present state of water-balance stu-dies in the USSR and abroad, and a review of the theoretical and scientific principles of the waterbalance method used to study 31 river basins of the Poles'ye Region of Belorussia and the Neman River Basin in East Central Europe. A method for calculating the water balance of lowland river basins of the nonchernozem zone for a 15-year period is based on hydrometeorological observations and practical illustrations. Formation of individual items of the water balance is examined in the light of possible application of cybernetic principles to water-balance studies. Results of longterm hydrologic investigations by the author are accompanied by references to the most important Soviet and foreign literature on problems of the water balance. The text is designed for use by specialists of scientific research institutes and watermanagement planning agencies and is of interest to instructors and undergraduate and graduate students in the fields of hydrometeorology and water-resources engineering. (Josefson-USGS) W72-05358

AN ENVIRONMENTAL ISOTOPE STUDY OF THE SOUTH-WESTERN KARST REGION OF

TURKEY, International Atomic Energy Agency, Vienna (Austria). For primary bibliographic entry see Field 02F. W72-05480

A RELATION BETWEEN PEAK DISCHARGE AND MAXIMUM TWENTY-FOUR HOUR FLOW FOR RAINFALL FLOODS, een's Univ., Kingston (Ontario). W. E. Watt.

Journal of Hydrology, Vol 14, No 3/4, p 285-292, December 1971. 4 fig, 2 tab, 2 ref.

Descriptors: \*Rainfall-runoff relationships, \*Floods, \*Peak discharge, \*Unit hydrographs, Hydrograph analysis, Design storm, Flood forecasting, Precipitation intensity, Rainfall intensity, Precipitation excess.

For floods resulting from isolated rainfall events for which areal and temporal variations in intensity are small, a one-parameter peak discharge-maximum 24 hour flow relation employing the basin lag is satisfactory. The suggestion relation is based on the n-linear reservoir model for the instantane ous unit hydrograph; it should have general application. As a particular example of its application the results of 34 storm events for 13 drainage basins in southern Ontario provided excellent agreement with the theoretical relation corresponding to a value of n of 6.5. (Knapp-USGS) W72-05482

OBTAINING OVERLAND FLOW RESISTANCE BY OPTIMIZATION,

ricultural Research Service, Boise, Idaho. Northwest Watershed Research Center. For primary bibliographic entry see Field 02E. W72-05644

#### SCIENTIFIC FRAMEWORK OF WORLD WATER BALANCE.

UNESCO-IASH Contribution to International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 7, 1971. 27 p, 2 tab, 34 ref.

Descriptors: \*Water balance, \*Hydrologic budget, Water demand, International Hydrological Decade, Long-term planning, Scientific personnel, Water resources development, Reviews, Hydrologic cycle, Hydrology.

The panel on Scientific Framework of the International Hydrological Decade Working Group on the World Water Balance reached the conclusion that the objectives of the World Water Balance Pro-gram should be actively pursued along three main lines: (a) Synthesis of existing data; (b) Accumulation of new data; (c) Development of new approaches. All available data should be used to obtain the best possible approximations of long-term water balances for river basins, countries, large natural regions, and continents, in that order. In the expansion of data networks, emphasis should be given to the standards of accuracy and reliability of new instruments. As the long-term aim of the World Water Balance Program is to develop a combined hydrological-meteorological model, an initial study should be undertaken of the problem in relating existing small-scale hydrological models to the much larger scale meteorological models. (Woodard-USGS) W72-05650

THE STANFORD MODEL APPLIED TO PIED-

MONT WATERSHEDS, Clemson Univ., South Carolina. Dept. of Agricultural Engineering.
J. T. Ligon, A. G. Law, and D. H. Higgins.

Paper No 70-730, presented at 1970 Winter Meeting of the American Society of Agricultural Engineers, Chicago, Ill., December 8-11, 1970. 21 p, 10 fig, 2 tab, 10 ref. OWRR A-010-SC (4).

Descriptors: \*Streamflow \*Watershed management, \*Computer models, \*Computer programs, Flow rates, Peak discharge, Hydrographs, Model studies, Systems analysis, Rainfall-runoff relationships.

The Stanford Watershed Computer Model was applied to two Piedmont watersheds in South Carolina, one with an area of 561 acres (0.877 square miles) and the other with an area of 44.0 square miles. With the smaller watershed, detailed attention was given to the influence of various model parameters on streamflow for various time periods (annual, monthly, daily, and storm periods). Good prediction of annual streamflow and fairly good prediction on a monthly basis were attained. Storm hydrographs were simulated less accurately. Peak flow rates were particularly troublesome on the smaller watershed, although the time of peak was very accurately simulated.
(Woodard-USGS)
W72-05860

EXPERIMENTAL INVESTIGATION OF SMALL WATERSHED FLOODS, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.
For primary bibliographic entry see Field 02E.

#### **Group 2B—Precipitation**

#### 2B. Precipitation

DISTRIBUTION FOR K-DAY RAINFALL

Ghent Rijksuniversiteit (Belgium). Astronomical Observatory and Seminar of the Theory of Probabilities and Mathematical Statistics.

P. Dingens, and H. Steyaert. International Association of Scientific Hydrology Bulletin, Vol 16, No 3, p 19-24, September 1971. 1 fig, 1 tab, 7 ref.

Descriptors: \*Rainfall, \*Distribution patterns, \*Statistical methods, Time series analysis, Statistical models, Probability. Identifiers: Ghent (Belgium).

Distribution functions proposed to represent precipitation totals are reviewed. A transformed incomplete gamma distribution was useful.

Precipitation totals contain, as particular cases or as limit-cases, the distributions usually employed for daily, weekly, monthly, and annual precipitation. Periods shorter than a day, as well as intensi-ty distribution may be calculated by the same law. The general validity of the proposed law is confirmed by applying it to the rainfall data collected at the Observatory of Ghent. (Knapp-USGS) W72-05334

WEIGHT CAPACITY REQUIREMENTS FOR PRECIPITATION MEASUREMENTS IN THE WASATCH MOUNTAINS,

Utah Water Research Lab., Logan,

G. W. Reynolds.

Water Resources Research, Vol 8, No 1, p 249-254, February 1972. 1 fig, 3 tab, 2 ref. 14-06-D-6820

Descriptors: \*Precipitation gages, \*Data collec-Descriptors: "Precipitation gages, "Data collec-tions, "Snowfall, "Telemetry, "Instrumentation, Water equivalent, Hydrologic data, Networks, Network design, Water yield, Snowpacks, Weather modification, Monitoring, Utah. Identifiers: "Wasatch Mountains.

The reasonable readout resolution and the accuracy of the data from the telemetering precipitation easurement stations of the Wasatch Weather Modification Project are inversely related to the assigned measurement range. Consequently, provision for precipitation amounts much in excess of the amounts actually experienced results in an unnecessary loss of information. For the winter season and for the liquid water equivalent concerned, only a few locations need the 70-inch capacity; 60 inches will suffice for most high altitude-high yield stations; 36 inches is ample for low altitude-high yield stations; 20 inches is more than adequate for low altitude-low yield stations. Volume capacity requirements are somewhat higher because of the delay of melting in the collection can. (Knapp-USGS) W72-05336

PRECIPITATION TELEMETRY IN MOUN-TAINOUS AREAS,

Utah Water Research Lab., Logan. D. G. Chadwick.

Water Resources Research, Vol 8, No 1, p 255-258, February 1972. 3 fig.

Descriptors: \*Precipitation gages, \*Data collections, \*Snowfall, \*Telemetry, \*Instrumentation, water equivalent, Hydrologic data, Networks, Network design, Water yield, Snowpacks, Weather modification, Monitoring, Utah. Identifiers: \*Wasatch Mountains.

A battery-operated telemetry system having high resolution and accuracy was developed at the Utah Water Research Laboratory. The system is used for telemetering precipitation data from 45 remote mountain sites in the Wasatch and Uinta mountain ranges. At selected sites temperature, wind, and the water content of snow are also

telemetered. The use of a unique pick-off sensor on the transducer also permits the system to be readily adapted to telemeter information from many recording-type instruments such as a baro-graph. (Knapp-USGS) W72-05337

OPTIMUM GAGING OF THUNDERSTORM RAINFALL IN SOUTHEASTERN ARIZONA, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center. H. B. Osborn, L. J. Lane, and J. F. Hundley. Water Resources Research, Vol 8, No 1, p 259-265, February 1972. 5 fig, 3 tab, 3 ref.

Descriptors: \*Rain gages, \*Network design, \*Thunderstorms, \*Arizona, Rainfall intensity, Rainfall-runoff relationships, Runoff forecasting, Data collections, Hydrologic data. Identifiers: \*Walnut Gulch Watershed (Ariz).

About 70% of the annual precipitation on the Wal-nut Gulch Experimental Watershed in southeastern Arizona occurs as thunderstorm rainfall during the 3-month period from July through September. The summer thunderstorms produce high intensi-ty, short duration rains of limited areal extent. Records from long-term stations give good estimates of the average annual and seasonal precipitation for a region, but networks of recording gages are necessary to describe individual storms and seasonal rainfall on finite watersheds. The optimum rain gage density varies inversely with water shed size and directly with the required accuracy. For example, to correlate rainfall and runoff, a 1 sq mi watershed with a length-width ratio of 4 requires a network of three recording rain gages. For watersheds of approximately 120 acres or less, the optimum network for rainfall-runoff correlation is one recording rain gage. Generally, the number of gages required per unit area decreases as the watershed size increases up to about 10 sq mi. A network of gages located at 1.5-mile intervals is necessary to correlate adequately the thunderstorm rainfall and runoff for watersheds of 10 sq mi and more. (Knapp-W72-05338

INTENSITY-DURATION-FREOU-ENCY RELATIONS FOR THE WASATCH MOUNTAINS OF NORTHERN UTAH, Forest Service (USDA) Ogden, Utah. Intermoun-

tain Forest and Range Experiment Station. E. E. Farmer, and J. E. Fletcher.

Water Resources Research, Vol 8, No 1, p 266-271. February 1972. 2 fig. 2 tab. 13 ref.

Descriptors: \*Frequency analysis, \*Rainfall intensity, \*Depth-area-duration analysis, \*Utah, Alpine, Mountains, Topography, Runoff forecasting, Meteorological data, Meteorology, Climates, Climatology, Precipitation gages.

Identifiers: Intensity-duration-frequency analysis.

Date from 25 precipitation intensity stations in central and north-central Utah at altitudes of 4350-10,150 feet were analyzed. All data were collected from May 1 to October 31. Each station has 10 or more years of record; one station has 30 years of record. Analyses were made of (1) record consistency, (2) definition of local precipitation zones, (3) intensity-duration-frequency characteristics,(4) 24-hour depths, (5) monthly depths and number of storms, (6) storm occurrence by hour of the day, and (7) storm occurrence by storm duration. The precipitation zone at 6500-8000 feet altitude should receive the greatest rainfall intensities. There is a trend toward reduced intensities with increasing elevation, but the trend is not uniform. Precipitation zones receiving the greatest intensity of rainfall do not coincide with those zones receiving the greatest depth of rainfall. Rainfall depth generally increases with altitude. There is a marked difference between two study areas with respect to the distribution of storm occurrence by

hour. This difference is attributed to differences in storm type and in the principal source of summer moisture. Average storm length varies inversely with altitude. (Knapp-USGS)

THE EFFECT OF SHELTERWOOD FELLINGS ON THE CHANGE IN THE PHYTOCLIMATE

For primary bibliographic entry see Field 04C. W72-05398

ON THE DECOMPOSITION OF THE EXTREME VALUE DISTRIBUTION OF DAILY RAINFALL DEPTHS AND THE DERIVATION OF PROBA-BILITIES OF COMPOUND EVENTS, Institute for Land and Water Management

Research, Wageningen (Netherlands). P. T. Stol.

Journal of Hydrology, Vol 14, No 3/4, p 181-196, December 1971. 11 fig, 4 tab, 2 ref.

Descriptors: \*Probability, \*Variability, \*Rainfall, \*Statistical methods, Meteorological data, Data processing, Time series analysis. Identifiers: \*Extreme value distribution.

Irregularities were found in extreme value distributions of monthly extremes of daily rainfall depths in the eastern part of the Netherlands (Winterweijk). Two types of extremes play a role in the composition of the sample. A rough classification based on the occurrence of monthly and annual extremes in a given month. Rather than refin-ing the method of classification, the method of calculating the probabilities of compound events when extremes of either class occur in a given month was developed. (Knapp-USGS) W72-05477

TRITIUM FALLOUT IN SOUTHERN AUS-TRALIA AND ITS HYDROLOGIC IMPLICA-

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.

G. B. Allison, J. W. Holmes, and M. W. Hughes Journal of Hydrology, Vol 14, No 3/4, p 307-321, December 1971. 6 fig. 4 tab, 25 ref.

Descriptors: \*Tritium, \*Fallout, \*Tracers, \*Groundwater movement, Water resources development, Tracking techniques, Sampling, Data collections Identifiers: \*Australia.

The tritium concentration in rainfall collected at 11 sampling stations in southern Australia was determined for the years 1966-1970. The concentration, which generally is of magnitude 30 to 60 atoms of tritium per 10 to the 18th power atoms of all hydrogen species, shows well-defined peaks in spring and summer rainfall, and increases significantly at sampling locations towards the interior of the continent. The level of tritium is considerably higher than the natural abundance, but after reaching a peak, it is now declining and presumably will approach the pre-bomb concen-tration of about 6 T.U. The purpose of the analyses is to obtain tritium input functions for water entering underground storage, as a necessary first step in using tritium concentration of groundwater to determine residence times and make an inventory of water resources. (Knapp-USGS) W72-05484

WEATHER MODIFICATION IN WATERSHED

MANAGEMENT, Fresno State Coll. Foundation, Calif. Atmospheric Water Resources Research. For primary bibliographic entry see Field 03B. W72-05489

#### 2C. Snow, Ice, and Frost

SNOW MEASUREMENT PREDICAMENT, National Oceanic and Atmospheric Administra-tion, Silver Spring, Md. Hydrologic Research and E. L. Peck.

Water Resources Research, Vol 8, No 1, p 244 248, February 1972. 2 fig, 1 tab, 9 ref.

\*Snow Descriptors: \*Snowfall, surveys, \*Precipitation gages, Snowmelt, Runoff forecast-ing, Mathematical models, Model studies, Data collections, Hydrologic data. Identifiers: Snow measurement.

Increased interest in snow and snowmelt runoff has resulted in the need for a better knowledge of snowfall and the water equivalent of snow cover. Present measuring methods are valuable for seasonal runoff prediction and other water management requirements in major snow areas. However, more accurate estimates of the actual snowfall and the average areal snow cover are required for detailed water budget and water use studies and for input for conceptual forecasting models. The limitations of present measuring systems are analyzed, and guidelines for their usefulness as indices are presented. The basic problems involved in determining more representative values are discussed, and suggestions are given for methods to improve measurements. (Knapp-USGS) W72-05335

SOIL REGIMES IN THE POLAR NORTH. (THE ACADEMY OF SCIENCES OF THE USSR. THE KOLA BRANCH. THE POLAR-ALPINE BOTANICAL GARDEN). Akademiya Nauk SSSR, Kirov. Polyarno-Alpüskii

Botanicheskii Sad. For primary bibliographic entry see Field 02G.

W72-05373

SEASONAL DYNAMICS OF SOIL PROCESSES IN THE POLAR NORTH,
For primary bibliographic entry see Field 02G.

W72-05383

MITROCOMELLA HYDROMEDUSAE POLYDIADEMATA AND M. CRUCIATA AS IN-DICATORS OF BOREAL AND ARCTIC WATERS.

Moscow State Univ. (USSR).

V. A. Yashnov Zool Zh. 49 (12): 1780-1788. 1970. Illus. Map. En-

glish summary.
Identifiers: Arctic, Boreal, Hydromedusae, Indicators, Mitrocomella-Cruciata, Mitrocomella-Polydiademata.

The distribution of 2 closely related species M. polydiademata and M. cruciata is considered with respect to the distribution of water masses. The structure of M. cruciata, long regarded as a doubt-ful species, is described. After its 1st description from the Massachusetts Bay (A.Agassiz, 1865), this species was never-found there. However, its discovery in the Barents Sea and Bering Strait withdraws all doubts. The species in question differ in the number of marginal tentacles and cirri located between them, as well as in the structure of gonads. The arctic species M. cruciata occurred in the Barents Sea in cold years at the beginning of this century (Linko, 1905, 1907), and the boreal species M. polydiademata was found in 1929 and 1947 when numerous representatives of warm water species penetrated in the west Barents Sea and cold water species migrated to the east. The disappearance of M. cruciata from the Massachusetts Bay may also be connected with the changes of hydrological conditions of this region. It is interesting that the arctic M. cruciata was

found in the Massachusetts Bay in cold 1862-1864 and the boreal M. polydiademata was found in the Gulf of Maine in warm 1913-1920. Fluctuations of ice cover in the Davis Strait and off Iceland and years of finding of both species are given.—Copyright 1971, Biological Abstracts, Inc.
W72-05391

SNOWPACK ACCUMULATION IN RELATION TO TERRAIN AND METEOROLOGICAL FAC-TORS IN SOUTHWESTERN MONTANA, Montana State Univ., Bozeman.

J. T. McPartland, A. B. Super, and V. L. Mitchell. Available from NTIS, Springfield, Va 22151 as AD-732 850 Price \$3.00 paper copy; 95 cents microfiche. Technical Report, August 1971. 96 p, 21 fig., 16 tab, 35 ref. AROD-7166.2-EN. DAHCO4-67-C-0058.

Descriptors: \*Snowpacks, \*Snow surveys, \*Mountains, \*Montana, Meteorological data, Elevations, Slopes, Topography, Data collections, Statistical methods, Water equivalent, Regression

Identifiers: \*Snowpack accumulation.

The relationships between mountain snowpack accumulation and terrain and meteorological parameters were investigated in three separate mountain areas in southwestern Montana. The parameters used (elevation, aspect, slope, geo-graphic location, and degree of potential windiess) were determined for each sampling site in the three study areas. These were used as terrain/meteorological parameters in the data analy-sis. Snowpack variables measured were snow depth and water equivalent. Statistical treatment of the data was performed through use of simple correlation and multiple linear regression analyses, and by principal component analysis. Snow depth was used as the snowpack variable throughout all analyses. However, a very high simple linear correlation consistently existed between the snow depth and water equivalent, indicating that the analyses apply equally to water equivalents. In the Bangtail area of the Bridger Range, elevation was generally the most important Range, elevation was generally the most important in explaining variance in snowpack depth. Variation in snowpack depth at the Carrot Basin area of the Madison Range and the Cooke City area of the Beartooth Range were largely explained by the elevation parameter. (See also W72-05498) W72-05497

INFRARED TEMPERATURE SENSING OF SNOW-COVERED TERRAIN,

SNOW-COVERED TERRAIN, Montana State Univ., Bozeman. B.A. Shafer, and A. B. Super. Available from NTIS, Springfield, Va 22151 as AD-732 849 Price \$3.00 paper copy; 95 cents microfiche. Technical Report, August 1971. 95 p, 21 fig., 7 tab, 31 ref. AROD-7166.1-EN. DAHCO4-67-C-0058.

Descriptors: \*Snow cover, \*Temperature, \*Measurement, \*Remote sensing, \*Data collections, Analytical techniques, Instrumentation, Infrared radiation, Thermal radiation, Arctic, Snow. Identifiers: \*Snow-surface temperatures, Radiometer.

Remote sensing of snow-surface temperatures was investigated with a Barnes IT-3 infrared thermometer. Much of the work concentrated on determining the vertical emissivity of dry snow in the atmospheric infrared window region between 8 and 14 microns. The emissivity of various snow surface types was measured using an apparatus called an emissivity box. An average emissiv the freshly fallen snow was found to be 0.975. An analysis of errors in radiometrically obtained snow-surface temperatures revealed that the IT-3 is capable of accurately measuring the true surface temperature to within 2 deg Celsius. Remote radiometric temperature sensing of snow surfaces appears to offer a potentially useful tool for monitoring surface temperature gradients in arctic en-vironments. (See also W72-05497) (Woodard-USGS)

DISTRIBUTION OF THERMOPHILIC BACTERIA IN ARCTIC AND SUBARCTIC HABITATS,

Colorado State Univ., Fort Collins. Dept. of Microbiology.

For primary bibliographic entry see Field 05B. W72-05618

NOTE ON CORRELATION COEFFICIENTS DERIVED FROM CUMULATIVE DISTRIBU-TIONS WITH REFERENCE TO GLACIOLOGI-CAL STUDIES.

Colorado Univ., Boulder. Inst. of Arctic and Aline Research

pine Research.
J. T. Andrews, B. D. Fahey, and D. Alford.
Journal of Glaciology, Vol 10, No 58, p 145-147,
1971. 1 tab, 20 ref. DA-ARO-D-31-124-G1163.

Descriptors: \*Glaciers, \*Geomorphology, \*Correlation analysis, Mathematical studies, Equations, Ablation, Lake ice, Glaciation. Identifiers: \*Glaciology, Correlation coefficients, Cumulative distributions.

In many areas of glaciology, cumulative degree days, either positive or negative, are regressed against another cumulative value, such as ablation or lake-ice growth. Very strong functional relationships are frequently found with high correlation coefficients. If pairs of random numbers are cumulated, the resulting correlation coefficients (r) are extremely high with a Fisher transformed mean of r=0.986 and standard error of plus or minus 0.001 (based on 50 individual computations of r which in turn were based on 20 cumulated In many areas of glaciology, cumulative degree of r which in turn were based on 20 cumulated pairs of random numbers between 0 and 99). These results indicate that caution must be excercised in e physical interpretation of data of this kind.

DELTAIC SEDIMENTATION IN GLACIAL LAKE DOUGLAS, Illinois State Geological Survey, Urbana.

For primary bibliographic entry see Field 02J. W72-05863

SNOWMELT TEMPERATURE INFLUENCE ON INFILTRATION AND SOIL WATER RETEN-TION.

Forest Service (USDA), Wenatchee, Wash. Forest For primary bibliographic entry see Field 02G. W72-05866

#### 2D. Evaporation and Transpiration

PHOTOSYNTHESIS AND TRANSPIRATION AS A FUNCTION OF GASEOUS DIFFUSIVE RE-SISTANCE IN ORANGE LEAVES,

Commonwealth Scientific and Industrial Research Organization, Merbein (Australia), Div of Horticultural Research.

P. E. Kriedemann Physiol Plant. 24 (2): 218-225. 1971. Illus.

Identifiers: Aperture, Citrus-Sinensis-D, Diffu-sive, Function, Gas, Gaseous, IR, Leaves, Mesophyll, Moisture, Orange-D, Photosynthesis, Resistances, Stomatal, Stress, Temperature, Transpiration.

The CO2 and H2O vapor exchange of single attached orange, Citrus sinensis (L.), leaves was measured under laboratory conditions using IR gas analysis. Gaseous diffusive resistances derived from measurements at a saturating irradi-ance and at a leaf temperature optimum for photosynthesis. Variation in leaf resistance (within

#### Group 2D-Evaporation and Transpiration

the range 1.6 to 60 s cm-1) induced by moisture status, or by cyclic oscillations in stomatal aperture, was associated with changes in both photosynthesis and transpiration. At low leaf resistance (r1 less than 10 s cm-1) the ratio of transpiration to photosynthesis declined with reduced stomatal aperture, indicating a tighter stomatal control over H2O vapor loss than over CO2 assimilation. At higher leaf resistance (r1 greater than 10 s cm-1) changes in transpiration and photosynthesis were linearly related, but leaf resistance and mesophyll resistance were also positively correlated, so that strictly stomatal control of photosynthesis became more apparent than real. This evidence, combined with direct measurements of CO2 diffuse resistances (in a -O2 gas stream) emphasized the presence of a significant mesophyll resistance, i.e. an additional and rate limiting resistance to CO2 assimilation over and above that encountered by H2O vapor escaping from the leaf.—Copyright 1971, Biological Abstracts, Inc.

A SIMPLE METHOD FOR DETERMINING TRANSPIRATION IN PLANTS, S. P. Nazarov, and L. P. Egoröva. Uch Zap Mord Univ. 84. 98-99. 1969. Identifiers: Plants, Transpiration.

An attached leaf is enclosed in a polyethylene bag for a few minutes, and the loss of water calculated by the difference in the weight of the bag with the leaf after exposure and the weight of the dried leaf and bag.—Copyright 1971, Biological Abstracts, Inc. W72-05365

LIQUID STORAGE, Phillips Petroleum Co., Bartlesville, Okla. (Assignee). For primary bibliographic entry see Field 03B. W72-05430

SHORELINE-AREA RATIO AS A FACTOR IN RATE OF WATER LOSS FROM SMALL SLOUGHS,

Canadian Wildlife Service, Saskatoon (Saskatchewan).
J. B. Millar.

Journal of Hydrology, Vol 14, No 3/4, p 259-284, December 1971. 15 fig, 3 tab, 22 ref.

Descriptors: \*Evaporation, \*Evapotranspiration, \*Lakes, \*Potholes, \*Water loss, Infiltration, Seepage, Phreatophytes, Wetlands, Wildlife habitats.
Identifiers: \*Prairie potholes.

At Melfort, Saskatoon, and Swift Current, Saskatchewan, the rate of water loss from small sloughs varies directly with the length of shoreline per unit area and, therefore, inversely with the size of individual sloughs. This relationship may be caused by lateral seepage to transpiring mar-ginal vegetation, soil evaporation and to groundwater. Maximum daily rate of water loss near Mel-fort is just over half (0.10 inches) that at Saskatoon and Swift Current (0.18 and 0.17 inches). The daily rate of seepage loss to groundwater is estimated to be 0.02 to 0.04 inches per 1,000 ft of shoreline per acre on heavy lacustrine clay at Melfort and dou-ble to triple that (0.07 inches) on sandy lacustrine material at Saskatoon and on medium textured gla-cial till at Swift Current. Therefore, during the growing season up to 60% of the shoreline-related water loss at Saskatoon and Swift Current and 60 to 80% of this loss at Melfort can be attributed to transpiration by marginal phreatophytic vegetation and evaporation from the soil surface. Shorelinerelated water loss accounts, on the average, for 10% or more of total water loss in sloughs 0.10 cre or less in size and for not more than 30 to 35% i total loss in sloughs larger than one acre. It is therefore, a major contributing factor to the rapid drying of all sloughs in the final stages of their ex-istence. (Knapp-USGS) W72-05481

EVAPOTRANSPIRATION REDUCTION, Meteorological Office, Poona (India). For primary bibliographic entry see Field 03B. W72-05700

EVAPORATION FROM DRYING SURFACES BY THE COMBINATION METHOD, Wisconsin Univ., Madison. Dept. of Soil and Water Sciences.

M. Fuchs, C. B. Tanner, G. W. Thurtell, and T. A. Black.

Agronomy Journal, Vol 61, No 1, January-February, 1969. 3 fig, 1 tab, 6 ref.

Descriptors: \*Evaporation, Soils, Vapor pressure, \*Soil moisture, \*Water vapor, Soil physics, Lysimeters, Heat flow, Soil temperature. Identifiers: \*Combination formula, \*Aerodynamic transfer coefficient.

The combination formula which explicitly includes the surface temperature is used to predict the hourly evaporation from a drying bare soil. The formula is valid regardless of the water vapor saturation deficit at the surface, but the measurement of the surface having a well-defined boundary with the atmosphere. Agreement with hourly evaporation measured by lysimetry at the same site was only fair because of a thermal lag in the energy balance of the lysimeter, but very good (within 1%) for the average daily values where the effect of thermal lag is negligible. All combination formulas use an aerodynamic transfer coefficient, which must include diabatic profile corrections unless sensible heat flux density is small relative to evaporation. Eddy correlation measurements of the sensible heat flux density into the air confirmed the transfer coefficient used. It is finally shown that the additional measurement of the water vapor pressure of the air can be used to relate the actual evaporation. (Skogerboe-Colorado State) W72-05702

VAPOR LOSSES THROUGH SOIL MULCH AT DIFFERENT WIND VELOCITIES, Punjab Agricultural Univ., Hissar (India). Dept. of

For primary bibliographic entry see Field 03B. W72-05705

RELATION OF WATER APPLICATION TO EVAPORATION AND STORAGE OF SOIL WATER.

Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div. H. R. Gardner, and W. R. Gardner.

Soil Science Society of America Proceedings, Vol 33, No 2, p 192-196, March-April, 1969. 8 fig, 1 tab, 7 ref.

Descriptors: \*Evaporation, \*Water storage, \*Diffusivity, Rainfall, Irrigation, \*Soil water, Loam, Water loss.

Identifiers: Rago loam, McGrew sandy loam.

Evaporation was measured from columns of Rago loan and McGrew loamy sand, to which water had been added at several rates ranging from 0.25 cm/day to 10.2 cm every 20 days. The water lost by evaporation varied from 100% of the total applied for the smallest and most frequent addition to 31.2% for the 10.2 cm of water added to McGrew soil every 20 days. The losses from repeated cycles of the individual treatments tended to approach a constant value that was less than the potential loss. As the amount added was increased for a given evaporation period, the loss tended to approach a constant value that also was much less than the potential loss. The cumulative evaporation curves were scaled to dimensionless variables and compared with a theoretical solution of the diffusivity equation for finite media. Using this

scaling-comparison technique, the losses from soil with two different potential evaporations were compared with predicted curves. (Skogerboe-Colorado State) w72-05706

WATER EVAPORATION FROM SOILS OF THE SOLONETZ COMPLEX OF THE TRANSVOLGA REGION DURING IRRIGATION (ISPARENIYE VLAGI POCHVAMI SOLONTSOVOGO KOMPLEKSA ZAVOLZH'YA PRI OROSHENIY, Akademiya Nauk SSSR, Moscow. Pochvennyi Intitut

stitut. A. G. Bondarev, and V. V. Rybina. Pochvovedeniye, No 6, p 87-96, June 1971. 3 fig, 4 tab, 5 ref.

Descriptors: "Soil physics, "Evaporation, "Transpiration, "Soil-water-plant relationships, "Soil types, Chestnut soils, Soil moisture, Moisture content, Wilting point, Water loss, recipitation (Atmospheric), Irrigation, Plant growth, Growth stages, Crops, Corn (Field), Wheat, Root zone, Evaporation pans.

Evaporation pans.
Identifiers: \*USSR, \*Volgograd Oblast,
\*Solonetzes

Investigations were conducted in 1966-67 in the Transvolga Region of the Volgograd Oblast to study water evaporation from Solonetz soils under various crops. Maximum evaporation loss from soil planted to corn was observed on dark soil of a depression, and the minimum loss on a Solonetz soil. Nonsolonetzic Chestnut soil occupied a middle position. Maximum average daily total water loss through evaporation (17-21 mm for corn and 11-13 mm for wheat) occurred after irrigation in the period between the heading and flowering stages of wheat and the tasseling and flowering stages of corn. Total water loss through evaporation between sowing and harvesting of corn for silage was 400-430 mm, which considerably exceeded the amount of moisture which the soil can retain in the root zone. Total evaporation from soil planted to wheat was also higher than the amount of water retained in the top-meter soil layer and, as in the case of corn, required irrigation during the growing period. (Josefson-USGS)

#### 2E. Streamflow and Runoff

SYNTHETIC SERIES PRODUCED BY MEANS OF PROBABILITY ANALYSIS AS APPLIED TO THE RIVER RHINE, L. Siegerstetter.

International Association of Scientific Hydrology Bulletin, Vol 16, No 3, p 103-113, September 1971. 6 fig, 3 tab, 18 ref. 3 append.

Using the Rhine as an example, a method is given which yields long-term predictions of river-flows on the basis of sufficiently long series of recordings. Hydrological processes are described using a nondeterministic model which justifies the application of statistic techniques. Since one specific prediction is not possible, conclusions are drawn from a number of forecasts. Analysis of the readings for the Rhine by autocorrelation and spectral analysis showed the possibility of a hidden five-year period. For this reason the series was studied in five-year moving samples. (Knapp-USGS)

CHANNEL PROCESSES DURING DIVERSION OF STREAMFLOW (RUSLOVYYE PROTSESSY PRI PEREBROSKE STOKA), For primary bibliographic entry see Field 08B.

#### Streamflow and Runoff—Group 2E

W72-05357

WATER BALANCE OF RIVER BASINS (VOD-WATER BALANCE OF RIVER BASINS (VOD-NYY BALANS RECHNYKH VODOSBOROV), Belorussian Water Research Inst., Minsk (USSR). Dept. of Hydrological Research. For primary bibliographic entry see Field 02A. W72-05358

SURFACE WATER SUPPLY OF THE UNITED STATES, 1960-65: PART 16. HAWAII AND OTHER PACIFIC AREAS. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 5 AND 6. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS, AND MISSOURI RIVER BASIN. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-05415

RUNOFF ANALYSIS BY ELECTRICAL CON-DUCTANCE OF WATER, Tokyo Univ. (Japan). Lab. of Irrigation and

R. Nakamura. Journal of Hydrology, Vol 14, No 3/4, p 197-212, December 1971. 9 fig, 2 tab, 11 ref.

Descriptors: \*Discharge measurement, \*Rainfall-runoff relationships, \*Water quality, \*Electrical conductance, Model studies, Simulation analysis,

Water chemistry, Stream gages, Base flow

By continuous measurement of conductance and By continuous measurement of conductance and discharge, the surface flow component could be separated from other components in the recession phase of hydrographs. The conductance-time curve and the hydrograph were both simultaneously simulated by a series of model reservoirs. The parameters of the model were adjusted by a trial-and-error method. The conductance factor used in this analysis made it possible to adjust rationally some of the runoff parameters. The portionally some of the runoff parameters. used in this analysis made it possible to adjust rationally some of the runoff parameters. The portion of the zone wetted by runoff water within or on the surface of the soil expands according to the precipitation magnitude. Water storage which is consumed in a long period of dry weather does not yield runoff water during storms. (Knapp-USGS) W72-05478

A RELATION BETWEEN PEAK DISCHARGE AND MAXIMUM TWENTY-FOUR HOUR FLOW FOR RAINFALL FLOODS,

Queen's Univ., Kingston (Ontario). For primary bibliographic entry see Field 02A. W72-05482

DETERMINATION OF THE TIME OF TRAVEL

ALONG THE RIVER NETWORK,
Bulgarian Academy of Sciences, Sofia. Inst. of
Hydrology and Meteorology.

Journal of Hydrology, Vol 14, No 3/4, p 293-306, December 1971. 11 fig, 5 ref.

Descriptors: \*Flood forecasting, \*Time lag, \*Chezy equation, Hydraulic radius, Rainfall-runoff relationships, Routing, Flood routing. Identifiers: Flood waves.

Hydrological forecasts for flood control and determination of the time of travel along river networks may be made on the basis of Chezy's formula. The method includes a new empirical coefficient k used to characterize the ratio between the hydrauused to characterize the ratio between the hydrau-lic radii of two river cross-sections, which define a given river reach. The value of k becomes stable when the discharge increases. This stabilization causes a preservation of the isochrone system for fairly high values of the discharge. The method is used in the solution of several examples, including plotting the isochrone system, and then a flood wave hodograph may be drawn. (Knapp-USGS) W72-05483

STREAM TEMPERATURES IN AN ALPINE

Forest and Range Experiment Station, Rangiora (New Zealand). F. A. Johnson.

Journal of Hydrology, Vol 14, No 3/4, p 322-336, December 1971. 10 fig, 3 tab, 8 ref.

Descriptors: \*Water temperature, \*Streamflow, \*Alpine, Vegetation effects, Solar radiation, Topography, Altitude, Forests. Identifiers: Stream temperatures.

The phase angles and amplitudes of sine curves fitted to the annual cycle of stream temperatures may be used as quantitative indices of the thermal characteristics of catchments and their associated stream waters. Higher altitudes result in lower stream waters. Inglet authors result in lower temperatures but for streams with similar altitu-dinal ranges, those with warmer aspects have higher temperatures. The extent of a forest cover influences temperatures by decreasing seasonal variations. (Knapp-USGS) W72.04382 W72-05485

PROBABILITY DISTRIBUTION OF FLOW EVENTS IN THE NEGEV AREA OF ISRAEL, Ministry of Agriculture, Jerusalem (Israel). Hydrological Service. M. Ben-Žvi, and A. Ben-Zvi.

Journal of Hydrology, Vol 14, No 3/4, p 348-353, December 1971. 1 fig, 3 tab, 2 ref.

Descriptors: \*Probability, \*Streamflow, \*Arid lands, Stream gages, Statistics, Sochastic processes, Streamflow forecasting, Flood processes, Streamflow forecasting, I forecasting. Identifiers: Wadis, Probability of streamflow.

The occurrence of a flow in a wadi is a random event. The number of flow events in a season is assumed as resulting from a homogeneous Poisson process. The agreement between the observations and the expected distribution is tested by the chisquared test. The combined record registered by three hydrometric stations is found consistent with the hypothesis. (Knapp-USGS) W72-05487

PRELIMINARY TESTS ON A VORTEX SHEDDING CURRENT METER, National Ocean Survey, Rockville, Md. For primary bibliographic entry see Field 08B. W72-05494

SHEAR FLOW PAST CIRCULAR CYLINDER. Bristol Univ. (England). Dept. of Civil Engineer-

ing. For primary bibliographic entry see Field 08B. W72-05643

OBTAINING OVERLAND FLOW RESISTANCE

BY OPTIMIZATION, Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center. D. L. Schreiber, and D. L. Bender.

D. L. Schreiber, and D. L. Bender.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY3, Paper
8773, p 429-446, March 1972. 8 fig, 3 tab, 26 ref,
append.

Descriptors: \*Flow resistance, \*Overland flow, \*Simulation analysis, \*Optimization, \*Mathemati-cal models, Numerical analysis, Rainfall-runoff Identifiers: Kinematic waves.

A mathematical model simulates and predicts overland flow hydrographs. The kinematic form of the nonlinear partial differential equations of un-steady, spatially varied, shallow-water flow are solved simultaneously by numerical integration. The mathematical model is verified by laboratory data obtained from a rainfall generator and a physical model. Parameter optimization provides a set of representative, synthetic, resistance-parameter values. The synthetic data and a dimensional analysis yield predictive resistance-paramesional analysis yield predictive resistance-parameter relationships. Power equations relate the resistance parameter to the precipitation number (precipitation rate divided by the product of unit discharge and downstream depth) during rainfall and to the Weber number after rainfall. Satisfactory and the product of the p ry results are obtained using a constant resistanceby results are obtained using a constant resistance-parameter value during rainfall and another smaller constant value during recession. This sug-gest that the hydrographs are fairly insensitive to changes in the precipitation number and the Weber number. (Knapp-USGS) W72-05644

A STUDY OF THE CHEMICAL QUALITY OF STREAMFLOW IN ARKANSAS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02K. W72-05647

WATER RESOURCES OF WISCONSIN, CEN-TRAL WISCONSIN RIVER BASIN, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-05653

EFFECTS OF URBANIZATION ON TIMING OF FLOOD PEAKS ON TOWN CREEK IN JACKSON, MISSISSIPPI, Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 04C.
W72-05841

SASKATCHEWAN'S WATER RESOURCES AND UTILIZATION,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch. A. T. Prince, and R. H. Clark. Canada Department of the Environment Inland Waters Branch Technical Bulletin No 47, 1971, 10

Descriptors: \*Water resources development, \*Semiarid climates, \*Surface waters, Foreign countries, Water yield, Precipitation (Atmospheric), Water storage, Water demand, Water utiliza-tion, Reservoirs, Lakes, Rivers, Reviews, Water distribution (Applied). Identifiers: \*Saskatchewan (Canada).

The mean annual precipitation for Saskatchewan is 16 inches. This figure is three-quarters of the Canadian average of about 20 inches but is only half of the annual precipitation in the other settled parts of Canada. Figures show the average precipitation for the various regions in Canada and the comparison of the average flow of rivers in the various parts of Canada. There is much less water available for development in this prairie region than anywhere else in the settled parts of Canada. The Saskatchewan River provides the principal drainage system and the principal source of water supply for the settled regions of the province. Smaller streams, rivers, and gullies also contribute to water availability. In the southern part of the province, there is about 4,500,000 acre-feet per year of runoff which does not reach the Saskatchewan River. Instead, it proceeds either southward to the Missouri system, eastward to Manitoba or it remains in the thousands of sloughs and small lakes. Redistribution in time is in common practice and storage reservoirs on the Saskatchewan-Nelson system have changed the system's regime. (Woodard-USGS) W72-05844

#### Group 2E—Streamflow and Runoff

EMBUDO, NEW MEXICO, BIRTHPLACE OF SYSTEMATIC STREAM GAGING, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07A. W72-05845

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR ESCONDIDO CREEK, SAN ANTONIO RIVER BASIN, TEX-AS, 1970, Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 07C.

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR CALAVERAS CREEK, SAN ANTONIO RIVER BASIN, TEX-

Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 07C. W72-05848

STEPHENSON COUNTY SURFACE WATER RESOURCES.

Illinois Dept. of Conservation, Springfield. Div. of Fisheries.

For primary bibliographic entry see Field 02H. W72-05867

MOULTRIE COUNTY SURFACE WATER RESOURCES,

Illinois Dept. of Conservation, Springfield. Div. of Fisheries. For primary bibliographic entry see Field 02H. W72-05868

COUNTY SURFACE WATER RESOURCES,

Illinois Dept. of Conservation, Springfield. Div. of Fisheries.

For primary bibliographic entry see Field 02H. W72-05869

EXPERIMENTAL INVESTIGATION OF SMALL WATERSHED FLOODS, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. E. F. Schulz, V. M. Yevjevich, M. E. Holland, D.

F. Kibler, and D. A. Woolhiser. Available from the National Technical Informa-

tion Service as PB-207 477, \$3.00 in paper copy, \$0.95 in microfiche. Colorado State University Environmental Resources Center Completion Report Series No 18, June 30, 1970. 126 p, 3 append. OWRR B-030-COLO (3).

\*Rainfall-runoff Descriptors: relationships. Hydraulic models, "Surface runoff, Stream gages, Colorado, Small watersheds, Model studies, Mathematical models, Runoff forecasting, Streamflow forecasting, Rainfall sin Simulated rainfall, Artificial precipitation. Identifiers: Kinematic wave theory, Experimental watershed.

An outdoor experimental watershed was built and consisted of a conic section with 120 deg interior angle, a radius of 110 ft and a uniform slope of 5% The watershed surface was stabilized by covering with a sheet of butyl rubber. Rainfall is simulated by overlapping sets of patterns from 164 sprinkler heads set at 10 ft above the watershed surface. The simulated rainfall was uniformly distributed in time and space; but many variations in distribution are possible for future experiments. Runoff is measured by a 1.5-ft H-flume equipped with a modified FW-1 water stage recorder. The kinematic wave theory can be applied to computing output hydrographs from the conic sector by considering the watershed as a 5-element kinematic cascade where each succeeding element is nar-rower than the previous element. For converging

flow on the conic section, it was found that it cannot be characterized as laminar. Appendix 1 by M. E. Holland describes the design and testing of the controlled experimentation, and includes 26 figures. Appendix III gives a summary of the experiments and preliminary results of experimental investigation on the kinematic theory of overland investigation on the kinematic treby of victorial flow. Appendix II is a published report, 'The Kinematic Cascade as a Hydrologic Model,' by D. F. Kibler and D. A. Woolhiser. (See W72-05874, W72-05875 and W70-06843) (Lang-USGS)

COLORADO STATE UNIVERSITY EXPERI-MENTAL RAINFALL-RUNOFF FACILITY---DESIGN AND TESTING OF RAINFALL

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

M. E. Holland. Colorado State University Environmental Resources Center Completion Report Series No 18, Appendix I, June 30, 1970. 80 p, 26 fig, 7 tab. OWRR B-030-COLO (3).

Descriptors: \*Rainfall-runoff relationships, \*Hydraulic models, \*Surface runoff, Stream gages, Colorado, Small watersheds, Model studies, Mathematical models, Runoff forecasting, Streamflow forecasting, Rainfall simulators, Simulated rainfall, Artificial precipitation. Identifiers: Kinematic wave theory

An outdoor experimental rainfall-runoff facility was constructed at Colorado State University. Initially the watershed consisted of a conic section having an interior angle of 120 deg, a radius of 110 feet and a uniform slope of 5%. The surface of the watershed was stabilized by covering with a sheet of butyl rubber. The rainfall is simulated by overlapping sets of rainfall patterns from 164 sprinkler heads set at 10 feet above the surface of the watershed. Almost any variation of rainfall distribution is possible because each of the 164 sprin-klers can be individually controlled according to any program. The runoff is measured through a 1.5-ft H-flume equipped with a modified FW 1 water stage recorder. (See also W72-05873 and W70-06843) (Knapp-USGS) W72-05874

COLORADO STATE UNIVERSITY EXPERI-MENTAL RAINFALL-RUNOFF FACILITY-S-UMMARY OF EXPERIMENTS AND PRELIMI-NARY RESULTS OF AN EXPERIMENTAL IN-VESTIGATION ON THE KINEMATIC THEORY OF OVERLAND FLOW

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

Colorado State University Environmental Resources Center Completion Report Series No 18, Appendix III, June 30, 1970. 19 p, 4 fig, 1 tab. OWRR B-030-COLO (3).

\*Rainfall-runoff relationships. Descriptors: Pescriptors: "Raintair-funor: relationsings, 'Hydraulic models, "Surface runoff, Stream gages, Colorado, Small watersheds, Model stu-dies, Mathematical models, Runoff forecasting, Streamflow forecasting, Rainfall simulators, Simulated rainfall, Artificial precipitation. Identifiers: Kinematic wave theory.

Experiments were run in a hydraulic watershed model to test the hypothesis that the kinematic wave equations are an adequate mathematical model for overland flow on a linearly converging surface. A second objective was to investigate th effect of spatially non-uniform roughness on the watershed response. The Kinematic Model is accurate for the converging flow case with a slope of 5%. The size of the experimental watershed makes it suitable for studying effects of spatially variable roughness. (See also W72-05873 and W70-06843) (Knapp-USGS) W72-05875

#### 2F. Groundwater

INTERNATIONAL SURVEY ON MANAGE-INTERNATIONAL SURVEY ON MANAGE-MENT OF ARTIFICIAL RECHARGE - ANALY-SIS AND SYNTHESIS OF RESPONSES (INVEN-TAIRE INTERNATIONAL DES AMENAGE-MENTS D'ALIMENTATION ARTIFICIELLE -DEPOUILLEMENT ET SYNTHESE DES

RESPONSES), Burgeap S.A., Paris (France). For primary bibliographic entry see Field 04B. W72-05331

FORMATION WATERS, HOT SPRINGS AND MINERALIZATION PHENOMENA ALONG THE EASTERN SHORE OF THE GULF OF

SUEZ, Geological Survey of Israel (Jerusalem). For primary bibliographic entry see Field 02K. W72-05333

IMPORTANT CONSIDERATIONS IN THE PROCESS OF DESIGNING A GROUNDWATER DATA COLLECTION PROGRAM, Geological Survey, Washington, D.C. Water Resources Div. For primary bibliographic entry see Field 07A. W72-05341

PRINCIPLES OF GROUNDWATER DATA

ACQUISITION, Department of Energy, Mines and Resources, Ota (Ontario). Computer Research Section. J. A. Gilliland.

ter Resources Research, Vol 8, No 1, p 182-187, February 1972. 3 fig, 7 ref.

Descriptors: \*Data collections, \*Hydrologic data, \*Groundwater, \*Hydrogeology, Instrumentation, Costs, Cost-benefit analysis, Planning. Identifiers: \*Groundwater data.

Any data acquisition program must be planned and designed to attain some objective, and since the objectives of different types of groundwater programs differ, each case must be considered on its own merits. Groundwater programs can be broken into three different categories, each requiring a different type of data: (1) water resource allocation and management, (2) water resource evalua-tion, and (3) research. Any water resource pro-gram involves significant costs, against which the probability of success must be weighed. Data acquisition costs cannot be considered separately from other costs because the individual processes involved in attaining the overall objective are all interrelated; e.g., a saving in data acquisition costs may lead to increased processing costs. The way in which the various tools of hydrogeology (instruments, techniques, and so on) affect the costs, the precision, and the reliability of results for the three types of programs are considered, and ways by which costs can be reduced and efficiency increased are examined. (Kanpp-USGS) W72-05342

PROPOSED CRITERIA FOR DESIGN OF A DATA COLLECTION SYSTEM FOR GROUND-WATER HYDROLOGY IN CALIFORNIA, 1970-

-2000, Geological Survey, Menlo Park, Calif. L. C. Dutcher.

Water Resources Research, Vol 8, No 1, p 188-193, February 1972. 1 ref.

Descriptors: \*Data collections, \*Hydrologic data, \*California, \*Groundwater, Hydrogeology, In-strumentation, Planning, Water management (Ap-plied), Mathematical models, Model studies, Systems analysis. Identifiers: \*Groundwater data.

Design of a groundwater data collection system requires the recognition of several important concepts. (1) Groundwater is not an isolated resource;

precipitation and surface water are important boundary conditions and water quality is an essen-tial parameter. (2) Most groundwater data are not tial parameter. (2) Most groundwater data are not transferable; thus the network must be based on unique programs for each basin. (3) Data needs must relate to the anticipated stress on the basin, and stress should be related to time, both lag time in the response to hydrologic stress should be rlated to time, both lag time in the response to hydrologic stress, should be rlated to time, both lag time in the response to hydrologic stress, and lead time needed by management. (4) Cost of data is related to data density and accuracy a program design must conmanagement. (a) Cost of the design must consider levels of funds. (5) The relatively small time variability and pronounced spatial variability of the environmental factors necessitates major emphasis on the appraisal of areal units. (6) The parametric data needed for completing areal interestinations at a several least of the days and on the completing area. vestigations at several levels of study are based on physical, hydrologic, and chemical heterogeneity coefficients derived for each basin. (7) Ultimately the complexity of the water use and the resulting changes of the system, in relation to the un-developed state, will be such that first generation models of the groundwater basin can no longer supply answers to the intricate and complex questions needing answers. A management model of each heavily stressed basin will be needed to ensure that data collection programs fulfill the requirements imposed by the economic, political, legal, social, and hydrologic constraints. (Knapp-USGS) W72-05343

CRITERIA FOR GROUNDWATER LEVEL DATA NETWORKS FOR HYDROLOGIC AND MODELING PURPOSES,

California State Dept. of Water Resources, Sacra-

For primary bibliographic entry see Field 07A. W72-05344

ANALYSES OF SELECTED STATISTICAL METHODS FOR ESTIMATING GROUND-WATER WITHDRAWAL,

Geological Survey, Denver, Colo. R. R. Luckey.

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Water Resources Research, Vol 8, No 1, p 205-210, February 1972. 8 fig, 1 tab, 3 ref.

Descriptors: \*Statistical methods, \*Withdrawal, \*Hydrologic data, \*Data collections, Sampling, Data processing, Colorado, Statistics, Regression analysis, Water yield.

A procedure for estimating groundwater withdrawal ideally should (1) maintain an acceptable level of accuracy and (2) significantly reduced data collection. Random sampling and regression analysis meet these objectives. Random sampling theory allows the calculation of sample size any combination of accuracy limit and probability level, once the population type of parameters have been determined. Groundwater withdrawals in the Arkansas River valley in southeastern Colorado exhibit an approximately log normal distribution with a standard deviation of 1.25. Gross annual withdrawal can be estimated within 15% at the 0.90 probability level from a sample of 225 wells (about one-fourth the number presently monitored). Random samples of actual data show errors that agree closely with errors predicted by sampling theory. Annual withdrawal can be related to independent variables using regression techniques. The independent variables used in this study were (1) annual precipitation, (2) total annual canal diversion, (3) annual electrical energy used by pumps, and (4) change in groundwater storage during the irriga-tion season. The standard errors of estimate of the four regressions, which used four or five data points each, ranged from 8900 ac ft/yr for the rela-tion between annual withdrawal and change in groundwater storage during the irrigation season to 17,700 ac ft/yr for the relation between annual withdrawal and precipitation. The mean annual groundwater withdrawal was 122,000 acre-feet. (Knapp-USGS) W72-05346

SURROGATE MODELING, General Electric Co., Santa Barbara, Calif. TEM-

Water Resources Research, Vol 8, No 1, p 212-216, February 1972. 2 fig, 8 ref.

Descriptors: \*Simulation analysis, \*Mathematical models, \*Data collections, \*Hydrologic data, Monte Carlo method, Model studies, Statistical methods, Statistics.
Identifiers: \*Error analysis.

To improve the accuracy and completeness of a data base is expensive. Mathematical models and digital computer simulation techniques make a quantitative evaluation of the worth of improving the data base possible by empirical sensitivity analysis. Triangular and log trianguoar error distributions are suitable for Monte Carlo expensions in investigate the effect of different degrees. ments to investigate the effect of different degrees of data accuracy. (Knapp-USGS)
W72-05347

DEFINITION OF HYDROLOGIC UNITS FOR WATER STUDIES IN ARKANSAS, Geological Survey, Little Rock, Ark.
M. S. Bedinger, and R. T. Sniegocki.
Water Resources Research, Vol 8, No 1, p 217-221, February 1972. 5 fig.

Descriptors: \*Data collections, \*Hydrologic data, \*Hydrogeology, \*Arkansas, Model studies, Groundwater, Surface-groundwater relationships, Water balance, Hydrologic budget, Groundwater basins, Network design. Identifiers: \*Groundwater data.

Cause-effect models that incorporate the physical and flow characteristics of the hydrologic system in Arkansas can serve as tools to predict the effects of various stresses on the system. Another very important use of models is to evaluate the adequacy of the data networks in meeting the data needs of the state. Arkansas is divided into several flow subsystems for use as study units. Natural flow subsystems for use as study units. Natural hydrologic boundaries of a stream and of the groundwater flow parts of a system commonly do not coincide. In the coastal plain, the natural aquifer boundaries are taken as the principal boundaries of the hydrologic subsystems, and natural surface water boundaries may enclose an additional peripheral area that must be considered. In normal peripheral area that must be considered. In the interior highlands, surface water divides are the principal boundaries of the hydrologic subsystems. (Knapp-USGS) W72-05348

AN APPROACH TO THE DESIGN OF STATE-WIDE OR REGIONAL GROUNDWATER IN-FORMATION SYSTEMS, Geological Survey, St. Paul, Minn. Water Resources Div.

rces Div. T. C. Winter.

Water Resources Research, Vol 8, No 1, p 222-230, February 1972. 2 fig.

Descriptors: \*Data collections, \*Hydrologic data, \*Sampling, Mapping, Statistics, Planning, Hydrogeology, Groundwater. Identifiers: Groundwater data.

The design of water information or basic data systems must be flexible enough to provide infor-mation and data for a broad range of interests from national to local. The system must satisfy the need for information for accounting, surveill for information for accounting, surveillance, and areal synthesis purposes. The network is designed by identifying specific needs in terms of maps, analyses, and studies that will provide the basic knowledge for understanding each particular phase of the groundwater system. Each specific need is then analyzed with respect to whether it will provide information on accounting, surveillance, or areal synthesis. If a particular type of map, analysis, or observation can serve any of these three functions, a network of data collection these three functions, a network of data collect or a program of studies is outlined in detail that

will provide the information needed. The method of design necessitates the establishment of accuracy levels for maps, the density of data points, confidence limits, and so forth. The information system should be under the general guidance of a single agency, but much of the work and responsibility to carry out the details of the system must be shared by a number of agencies. (Knapp-USGS) W72-05349

DATA NEEDS FOR PREDICTING PROBLEMS CAUSED BY THE USE OF SUBSURFACE RESERVOIRS,

Geological Survey, Denver, Colo. Water Resources Div. For primary bibliographic entry see Field 05B. W72-05350

GEOCHEMISTRY OF AQUEOUS DISPERSION HALOS OF MERCURY DEPOSITS AND MERCURY MIGRATION MODES IN GROUND-WATER (GEOKHIMIYA VODNYKH OREOLOV RASSEYANIYA MESTOROZHDENIY RTUTU I FORMY YEYE MIGRATSII V PODZEMNYKH

VODAKH),
All-Union Scientific Research Inst. of
Hydrogeology and Engineering Geology, Moscow
(USSR).

For primary bibliographic entry see Field 05B. W72-05351

EFFECT OF ENVIRONMENT ON THE ACTIVI-TY OF DIPHENAMID, Cornell Univ., Ithaca, N.Y. Dept. of Vegetable

Crops.
M. R. Lynch, and R. D. Sweet.
Weed Sci. 19 (4): 332-337. 1971. Illus.
Identifiers: Diphenamid, Echinochloa-CrusgalliFrumentacea-M, Environment, Herbicide, Humidity, Lactuca-Sativa-D, Light, LycopersiconEsculentum-D, Raphanus-Sativus-D.

The activity of foliage applications of N,N-dimenthyl-2,2-diphenylacetamide (diphenamid) was greatly enhanced by exposing the plants to high relative humidity for 6 hr immediately after chemical application. Growing plants under low light intensity further increased the activity of diphenamid under these conditions. This response occurred with a number of plant species, including tomato (Lycopersicon esculentum Mill.), Japanese millet (Echinochloa crusgalli (L.) Beauv., var. frumentacea), lettuce (Lactuca sativa L.), and radish (Raphanus sativus L.). Low light, but not high relative humidity, increased the activity of diphenamid as a soil application. Unaltered diphenamid and not its known metabolites seemed to be responsible for the increased activity of to be responsible for the increased activity of foliage sprays under conditions of low light and high relative humidity.—Copyright 1971, Biological Abstracts, Inc. W72-05370

HYDROGEOLOGY, HYDRODYNAMICS AND FORMATION OF GROUNDWATERS IN ORE DEPOSITS OF CENTRAL KAZAKHSTAN GIDROGEOLOGIYA, GIDRODINAMIKA I FORMIROVANIYE PODZEMNYKH VOD RUDNYKH MESTOROZHDENIY TSENTRAL'NOGO

NYKH MESTOROZHDENIT ISENTRAL NOGO KAZAKHSTANA), Akademiya Nauk Kazakhskoi SSR, Alma-Ata. In-stitut Gidrogeologi i Gidrofiziki. S. Zh. Zhaparkhanov, T. T. Makhmutov, S. B. Kunanbayev, and V. V. Krylov. Izdatel'stvo 'Nauka', Alma-Ata, 1970. 164 p.

Descriptors: \*Hydrogeology, \*Hydrodynamics, \*Groundwater, \*Mineralogy, \*Mining, Shafts (Excavations), Quarries, Boreholes, Aquifer characteristics, Hydrologic properties, Percolation, Inflow, Connate water, Water balance, Water chemistry, Water supply, Structural geology, Geologic manning. gy, Geologic mapping.

Identifiers: \*USSR, \*Kazakhstan, \*Mineral deposits, \*Ore deposits, Tectonics, Mineraliza-

#### Group 2F—Groundwater

This monograph, prepared on the basis of data obtained from a hydrogeological study of the Shet-skiy, Atasuyskiy and Dzhezdy mining regions of Central Kazakhstan, is the first summary work on the hydrogeology, hydrodynamics, chemistry, and formation of interstitial and interstitial-karst groundwaters of the area. Special attention is given to methods of forecasting flow from different formations into mines and to development of efficient measures to control mine flooding. Mines and quarries are mapped from the stand-point of predicting possible flooding in connection with deepening of mine shafts. Water balance of the regions is examined in the light of determining use of mine waters as a possible water-supply source. The text is intended for specialists engaged in the planning and utilization of groundwaters to serve mining industries and in the formulation of measures to control flooding of mines and quarries. (Josefson-USGS) W72-05416

AN ENVIRONMENTAL ISOTOPE STUDY OF THE SOUTH-WESTERN KARST REGION OF TURKEY,

International Atomic Energy Agency, Vienna

T. Dincer, and B. R. Payne. Journal of Hydrology, Vol 14, No 3/4, p 233-258, December 1971. 8 fig, 3 tab, 16 ref.

Descriptors: \*Tracers, \*Tracking techniques, \*Groundwater movement, \*Karst, \*Surface-groundwater relationships, Limestones, Water circulation, Radioisotopes, Stable isotopes, Hydrogeology, Radioactivity techniques, Tritium, Deuterium, Oxygen. Identifiers: \*Turkey.

Several lakes, rivers and karst springs in Southwestern Turkey were studied in detail using the natural tritium, deuterium and oxygen-18 contents of the waters. Stable isotopes were used to study the relation between inland lakes and coastal springs. The tritium content of springs gives valuable information on the transit time of water between time of recharge and sampling, and the time structure of water in the karst reservoir. Environmental isotopes also show the major components of flow in the karst, which consist of a seasonal flow through solution channels and a much slower movement through the base karst reservoir. (Knapp-USGS) W72-05480

TRITIUM FALLOUT IN SOUTHERN AUS-TRALIA AND ITS HYDROLOGIC IMPLICA-

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of

For primary bibliographic entry see Field 02B. W72-05484

STEADY DISPERSION ACROSS AN INTER-FACE IN A POROUS MEDIUM,
Technische Hogeschool, Delft (Netherlands). For primary bibliographic entry see Field 05B. W72-05486

WATER RESOURCES OF WISCONSIN, CEN-TRAL WISCONSIN RIVER BASIN, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-05653

SUMMARY OF THE HYDROLOGIC SITUA-TION ON LONG ISLAND, NEW YORK, AS A GUIDE TO WATER-MANAGEMENT ALTER-

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W72-05658

WATER AVAILABILITY OF MARENGO COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala. For primary bibliographic entry see Field 07C.

WATER AVAILABILITY OF CLARKE COUN-TY, ALABAMA, Geological Survey, Tuscaloosa, Ala. For primary bibliographic entry see Field 07C. W72-05843

LATE TERTIARY AND QUARTERNARY HYDROGEOLOGY OF ESTANCIA BASIN, CENTRAL NEW MEXICO, New Mexico Univ., Albuquerque. Dept. of Geolo-

F. B. Titus.

W72-05842

Ph D Thesis, 1969. 179 p, 18 fig, 69 ref, 3 append. OWRR B-005-NMEX (2).

Descriptors: \*Hydrogeology, \*Groundwater, \*Irrigation wells, \*New Mexico, \*Aquifer characteristics, Alluvium, Water yield, Pumping, Withdrawal, Specific capacity, Drawdown, Geolo-

gy. Identifiers: \*Estancia Valley (N. Mex).

Estancia Valley in Central New Mexico is a topographically closed basin of 2,000 square miles that contains more than 400 feet of valley fill. Rocks of Pennsylvanian to Cretaceous age underlie the valley fill and crop out in the sides of the basin except in limited areas where Precambrian rocks are exposed. The valley fill consists of 300 to 400 feet of alluvium, overlain in the central lowland by 100 feet of lacustrine clays. The lacustrine unit is divided into a lower lake sequence, a medial sand sequence, and an upper lake sequence. The basal part of the alluvial unit is probably of late Pliocene age. The unit accumulated as a result of slow structural subsidence, and during this period a river flowed south through Estancia Valley. Some irrigation wells in Estancia Valley yield more than 1,000 gpm from the alluvium. A few yields of more than 2,300 gpm have been measured. Specific capacities generally range between 20 and 80 gpm per foot of drawdown in wells that are known to be producing from the alluvial unit. (Woodard-USGS) W72-05851

PERCHED WATER TABLE AND GROUND-WATER FLOW IN THE SOUTHERN PART OF THE FOREST ZONE (VERKHOVODKA I VNUTRIPOCHVENNYY STOK V YUZHNOY VNUTRIPOCHVENNY 1 CHASTI LESNOY ZONY), Nauchno-Issledovatel-

skii Tsentr Leningrad (USSR).
For primary bibliographic entry see Field 02G.

W72-05852

GEOHYDROLOGY OF HUALAPAI AND SACRAMENTO VALLEYS, MOHAVE COUN-TY, ARIZONA,

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W72-05861

GEOCHEMISTRY OF ORGANIC MATTER IN (K GEOKHIMII OR-GROUNDWATER GANICHESKIKH VESHCHESTV PODZEM-

GANIC MANUAL STREET OF THE STREET OF T Inst. Hydrogeology and Engineering Geology, Moscow For primary bibliographic entry see Field 02K.

2G. Water in Soils

PSYCHROMETRIC TECHNIQUES FOR MEA-SURING SOIL WATER POTENTIAL, Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). For primary bibliographic entry see Field 07B. W72-05286

QUANTITY-INTENSITY RELATIONSHIPS FOR ABILE SODIUM IN FIELD SOILS, Rothamsted Experimental Station, Harpenden

Journal of Soil Science, Vol 22, No 4, p 417-429, December 1971. 6 fig, 3 tab, 28 ref.

Descriptors: \*Soil water, \*Soils, \*Geochemistry, \*Sodium, \*Ion exchange, Chemical reactions, Rain water, Isotherms, Testing, Equilibrium, Agriculture.
Identifiers: Field soils, Sodium ratios.

Exchange isotherms for Na with Ca+Mg in ten un-fertilized soils showed smaller buffer capacities for Na than K, larger Na than K activity ratios at equilibrium, and curvatures of the graphs at small Na activity ratios that indicate larger exchange energies on about 0.5% of the exchange sites. Since equilibrium Na activity ratios in the soils were similar to those in rain, the latter ratios could be most important in controlling Na activity ratios in soils and the percentage saturation of exchange complex with Na. The geochemical significance of these ratios is discussed. (Woodard-USGS) W72-05329

WATER-SALT REGIME OF CISCAUCASIAN FLOOD PLAINS (VODNO-SOLEVOY REZHIM POYMENNYKH ZEMEL' PREDKAVKAZ'YA), Industrial and Scientific Research Inst. for Engineering Surveys in Construction, Moscow (USSR).
S. P. Sokolovskiy, and G. S. Solopov.
Izdatel'stvo 'Nauka', Moscow, 1970. 144 p.

Descriptors: \*Flood plains, \*Soils, \*Soil water, \*Water balance, \*Salt balance, Salts, Salt tolerance, Saline soils, Soil types, Soil physical properties, Hydrogeology, Groundwater, tolerance, Saline soils, Soil types, Soil physical properties, Hydrogeology, Groundwater, Evapotranspiration, Infiltration, Runoff, Irrigation, Drainage, Water chemistry, Soil management, Land reclamation. Identifiers: \*USSR, \*Ciscaucasia, Kuma River, Kalaus River, Bol. Yegorlyk River, Solonetzes, Solonchaks, Mineralization, Hygroscopicity, Visaucrete.

Vinevards.

This monograph deals with a study of the most important characteristics of the groundwater and water-salt regime of flood-plain soils developed in steppe river basins of Ciscaucasia. The flood plains examined are those bordering the largest rivers of the territory—the Kuma, Kalaus, and Bol. Yegorlyk--and cover a reclaimable area of more than 50,000 ha. A wide range of problems, important from the reclamation standpoint, are amined, including critical groundwater depth, pore solutions, plant salt tolerance, and quantitative estimation of transpiration, evaporation, and irrigation losses. The water regime of the flood-plain soils is divided into three types: (1) infiltration with meadow and solonchak subtypes; (2) runoff; and (3) evapotranspiration. On the basis of soilhydrogeological conditions, the flood plains are divided into 3 meliorative groups: (1) regions with predominantly nonsaline and deeply-lying saline soils, requiring general soil-management programs and practices; (2) regions with a predominance of moderately saline soils, requiring general soilmanagement practices and, in some cases, installa-tion of drainage facilities; and (3) regions with strongly saline and waterlogged soils, requiring radical soil-improvement measures over the entire area. The text, prepared mainly from materials of soil and hydrogeological investigations conducted

Water in Soils—Group 2G

by the authors in the middle reaches of the Kuma River in 1960-64, is of particular interest to recla-mation specialists, hydrogeologists, soil scientists, and agronomists. (Josefson-USGS) W72-05355

AN IMPROVED METHOD OF SOIL MOISTURE CONTROL WITH OBSERVATIONS ON TO-MATO GROWTH AND WATER UPTAKE, ana Research Station, Abu Naama (Sudan).

H. R. B. Hack.

H. R. B. Hack.
J Exp Bot. 22 (71): 323-336. 1971. Illus.
Identifiers: Auto, Barostat, Cells, Control,
Frowth, Hydrostatic, Irrigation, Leaves, Method,
wloisture, Pressure, Reservoirs, Roots, Soil, Tensiometers, Tomato-D, Uptake.

The control of soil moisture depended on the arrangement of numerous auto-irrigation cells radi-ally around the plant, allowing relatively un-restricted spread of the root system, the cells being so placed that no point in the soil was more than about 1 inch from a water-supplying surface. Water for the cells was supplied from barostat reservoirs fixed at the levels required to give the target hydrostatic pressures of -27,-84, -149, and -266 mbars at the center of the cells. The degrees of soil moisture control achieved was assessed by soil moisture tensiometers. Three months after sowing mean matric potentials were reduced below target levels to minimum values of only -33, -104, -178, and -329 mbars. At this time some of the tomato plants had leaf areas in excess of 2000 cm2/plant and water uptakes of 200 ml/day/plant in the -27 mbars and of 150 ml in the -266 mbars treatment. Leaf areas per plant decreased with decrease in matric potential; leaf dry weight decreased with matric potentials less than -84 mbars; root growth, observed in glass panels, was depressed at both the largest and smallest matric potentials. The reduction in water uptake with decreasing matric potential was more than could be accounted for by a smaller leaf area alone.—Copyright 1971, Biological Abstracts, Inc. W72-05361

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SOIL REGIMES IN THE POLAR NORTH. (THE ACADEMY OF SCIENCES OF THE USSR. THE KOLA BRANCH. THE POLAR-ALPINE BOTANICAL GARDEN). Akademiya Nauk SSSR, Kirov. Polyarno-Alpiiskii

Nauka: Leningrad. 1969. 140 p. Illus. Pr. 1 ruble 20 kopecks.

Identifiers: Academy, Alpine, Book, Botanical, Branch, Garden, Growth, Kola, Low, Microor-ganisms, Moisture, North, Plant, Polar, Regimes, Sciences, Soil, Temperature, USSR.

The seasonal dynamics of moisture, chemical properties and microorganisms in podzolic, mountain podzolic, and mountain tundra soils of the Murmansk Region, as well as water transport of mineral elements in the northern taiga landscapes of the Kola Peninsula, the effect of low soil tem-peratures on the growth and development of cer-tain plants, and seasonal variation in the toxicity of podzolic soils are discussed.--Copyright 1971, Biological Abstracts, Inc. W72-05373

SOME WATER AND PHYSICAL PROPERTIES OF THE PRINCIPAL TYPES AND SUBTYPES OF IRRIGATED SOILS IN THE SEVAN BASIN, G. T. Ananyan.

Tr Nauch-Issled Inst Pochvoved Agrokhim Arm SSR. 4, 193-219, 1968.

Identifiers: Basin, Irrigated, Physical, Principal, Sevan, Soils, Types, USSR.

Data are presented on bulk density, specific gravity, porosity, texture, aggregate composition, maximum hygroscopicity, maximum field capacity of irrigated soils (medium and low-humus chernozems, dark chestnut, chestnut, light-chestnut,

meadow) for genetic purposes and for calculations of irrigation rates.—Copyright 1971, Biological Abstracts, Inc. W72-05374

HYDROPHYSICAL PROPERTIES OF SOILS IN THE KZYL-ORDA IRRIGATED MASSIF, R. K. Kievskaya.

Tr Inst Pochvoved Akad Nauk Kaz SSR, 17: 55-

Identifiers: Aggregates, Bulk, Coefficient, Densi-ty, Filtration, Gravity, Hydro, Irrigated, Kzyl-Orda, Massif, Moisture, Physical, Salinity, Soils, Specific, Surface, USSR.

Data are presented on granulometric and microag-gregate compositions, bulk density and specific gravity, porosity, maximum hygroscopicity, natural moisture content, field capacity, surface filtra-tion coefficient with and without plowing, and salinity of Kzyl-Orda irrigated massif.—Copyright 1971, Biological Abstracts, Inc.

CONSTRUCTION OF CALIBRATION GRAPHS FOR SOIL MOISTURE MEASUREMENTS BY
THE NEUTRON METHOD ON THE BASIS OF
COMPARED GRAVIMETRIC MEASUREMENTS IN THE FIELD,
Technische Universitaet, Munich (West Ger-

many). H. Hanus.

Z Pflanzenernaehr Bodenk. 128 (3): 220-227. 1971.

Illus. English summary. Identifiers: Calibration, Construction, Field, Graphs, Gravimetric, Measurements, Method, Moisture, Neutron, Soil.

Two regression lines may be made: One, when soil moisture content is regressed on pulse rate and the moisture content is regressed on pure rate and under other when pulse rate is regressed on soil moisture content. If there are great variances in soil moisture content at the same pulse rate and vice yersa, both regression lines show a great difversa, both regression lines show a great dif-ference. A functional relation between 2 factors cannot be characterized by 1 of the 2 possible regression lines but by the long axis of the ellipse around the points. This axis used as a calibration graph is not affected by relatively great errors in measurements. The construction of this axis is possible by theoretical formulas or by successive means (in vertical and horizontal direction) of points on the 2 regression lines. The calibration graph based on field measurements is the same as that from laboratory measurements, which has only small errors .-- Copyright 1971, Biological Abstracts. Inc. W72-05376

EXPERIMENTAL HYDROPHYSICS OF SOILS.
METHODS FOR THE DETERMINATION OF
SOIL MOISTURE POTENTIAL AND ITS
TRANSPORT COEFFICIENTS,
A. M. Globus.

Gidrometeoizdat: Leningrad. 1969. 335 p. Illus. Pr.

I ruble 68 kopecks.
Identifiers: Book, Capillary, Coefficients, Conductivity,
Determination,
Hydrophysics, Methods, Migration, Moisture,
Potential, Soil, Soils, Temperature, Transport.

The measurement and calculation of the coefficients of moisture conductivity and capillary diffu-sion under isothermal conditions, and methods for determination of nonisometric transport of soil moisture to facilitate the study of water migration in the presence of a temperature gradient are described.--Copyright 1971, Biological Abstracts,

EFFECT OF THE CLOSE TEXTURE OF DEEP CHERNOZEM ON CERTAIN PHYSICAL AND HYDROPHYSICAL PROPERTIES OF SOIL, I. P. Kotovrasov, and V. I. Beletskii.

Nauchn Zap Belotserk S-Kh Inst. 15 (2): 111-116.

Identifiers: Bulk, Capacity, Chernozem, Close, Deep, Density, Physical, Porosity, Soil, Texture, Waterholding.

Studies were made of the total, capillary and non-capillary porosities, total and capillary water-hold-ing capacities and available moisture in different parts of the arable layer in chernozems with dif-ferent bulk densities. The hydrophysical proper-ties were at their optimum when the bulk density was 1.1-1.2. Six soil gradations by bulk density are suggested.—Copyright 1971, Biological Abstracts,

GENESIS AND RATIONAL UTILIZATION OF SOILS (KAZAN UNIVERSITY).

Kazanskii Universitet: Kazan. 1969. 136 p. Illus.

Kazanskii Uliversiste.

Pr. 46 kopecks.
Identifiers: Book, Crop, Fertilizers, Genesis,
Kazan, Legume-D, Mineral Physical, Rational,
Rotation, Soils, Spruce-G, University, USSR.

Soil-formation conditions and analytical data on N, P, K and humus in soils, the distribution of trace elements, variations in the contents of these components and in certain physical properties of soils in the Tatar ASSR are discussed. Also, clas-sification of floodplain soils in the Republic, ef-fects of crop rotations on the contents of productive moisture, fertilizers, the winter-hardiness and yields of perennial legumes, as well as soils under spruce stands are described together with certain aspects of agricultural utilization of soils in Tataria.—Copyright 1971, Biological Abstracts, Inc.

SOILS OF PADDY FIELDS. COLLECTION OF PAPERS BASED ON THE PROGRAM DRAWN UP BY THE NINTH INTERNATIONAL CON-GRESS OF PEDOLOGISTS.

For primary bibliographic entry see Field 03F. W72-05380

THE MEADOW-CHERNOZEM SOILS OF THE

Z. S. Avundzhvan Tr Nauchno-Issled Inst Pochvoved Agrokhim Arm SSR. 4. 105-117. 1968. Russian summary. Identifiers: Armenian-SSR, Chernozem, Meadow, Soils, USSR.

dow-chernozem soils are formed at elevations of 1500-2200 m on high groundwater tables on the floodplain and on 1st terraces above the floodplain in Northern Armenia. Their weakly acid reaction, high absorption capacity, accumulation of free forms of Fe and other signs of gleyization in the lower profile are effects of their water regime.—Copyright 1971, Biological Abstracts, Inc. W72-05381

WATER REGIME OF ARABLE PERMAFROST FOREST-STEPPE SOILS,

T. Y. Kissis.

Nauka: Moscow. 1969. 134 p. Illus. Pr. 81 kopecks. Identifiers: Arable, Book, Forest, Permafrost, Regime, Soils, Steppe, Transbaikalia, USSR.

Meadow-forest permafrost soils form the bulk of Transbaikalian arable lands. The natural conditions of the Undino-Dvinskaya depression, the composition and properties of the soils and their water regime are described.—Copyright 1971, Biological Abstracts, Inc.

SEASONAL DYNAMICS OF SOIL PROCESSES IN THE POLAR NORTH,

A. V. Baranovskaya, V. I. Levina, and V. N.

#### Group 2G-Water in Soils

Nauka: Leningrad. 1969. 118. Illus. Pr. 1 ruble 4 konecks.

Identifiers: Book, Dynamics, Edaphic, Fertility, Flora, North, Polar, Processes, Seasonal, Soil.

The processes occurring in podzolic and peat-bog soils under the influence of polar agriculture were studied. The hydrophysical properties and the nutrient regime are described and compared with composition of edaphic microflora and soil fertility.—Copyright 1971, Biological Abstracts, Inc. W72-05383

THE EFFECT OF DRY CRUSHING AND WET PUDDLING TREATMENTS ON THE PHYSICAL PROPERTIES WILTING POINT AND ROOT GROWTH IN A SANDY LOAM AND A SILTY CLAY SOIL,

Cairo Univ. (Egypt). Faculty of Agriculture.
Abdalla Zein El-Abedine, M. Mahfouz Abdalla,
and Ozoris M. Ali

uAR J Soil Sci. 9 (2): 239-245. 1969/1970 (Arabic summary).

summary).
Identifiers: Clay, Crushing, Dry, Growth, Loam,
Physical, Point, Puddling, Root, Sandy, Silty,
Soil, Wet, Wilting.

Fine textured soils suffer more from crushing and puddling than coarser ones. Crushing and puddling affect pores and water conductivity and consequently the wilting point. These effects are reflected in the root growth of plants: the elongation of main root, the number of side roots and their length. The structural units are destroyed to some extent under the different processes of soil management especially those carried out when the soil is very wet.—Copyright 1971, Biological Abstracts, Inc. W72-05402

MODIFICATIONS OF PEAT SOILS UNDER THE INFLUENCE OF DRAINAGE AND CUL-TIVATION: PROCEDINGS OF THE SCIEN-TIFIC METHODS CONFERENCE OF MEMBER COUNTRIES OF THE COUNCIL FOR MUTUAL ECONOMIC AID.

Urozhai: Minsk. 1969. 231p. Illus. Pr. 87 Kopecks. Minist Sel'sk Khoz SSSR Beloruss Nauchno-Issled Inst Melior Vodn Khoz. 1-231. Illus. 1969. Identifiers: Book, Conference, Council, Countries, Cultivation, Drainage, Economic, Fertility, Member, Methods, Mineralization, Modification, Mutual, Organic, Peat, Proceedings, Scientific, Soils Substances.

The physicochemical properties of peat soils mainly in Belorussia and the improvement of fertility through chemical aids, drainage and cultivation are described. The mineralization of organic substances in peat soils in the course of their agricultural utilization is discussed.—Copyright 1971, Biological Abstracts, Inc. W72-05403

NUMERICAL SIMULATION TECHNIQUE FOR VERTICAL DRAINAGE FROM A SOIL COLUMN, Institute for Land and Water Management

Institute for Land and Water Management Research, Wageningen (Netherlands). F. Kastanek.

Journal of Hydrology, Vol 14, No 3/4, p 213-232, December 1971. 18 fig, 2 tab, 4 ref.

Descriptors: \*Soil water movement, \*Infiltration, \*Simulation analysis, \*Numerical analysis, \*Computer programs, Hydraulic conductivity, Percolation, Mathematical models, Unsaturated flow, Saturated flow, Unsteady flow, Capillary conductivity.

A numerical method for simulating the time-dependent drainage from a vertical soil column of-fers the possibility of computing the discharge as well as the hydraulic gradient for any desired time, if the capillary conductivity and the moisture content of the soil are given as functions of suction.

The soil column is modeled by thin layers, each having different capillary conductivity and water content. The number of layers, their individual thickness and their position is time dependent and their determination is inherent in the calculation procedure. For each layer a water balance is made for small time intervals. The required calculation procedure is programmed in FORTRAN-Subset for IBM 1130. (Knapp-USGS) W72-05479

THE OCCURRENCE OF ETHYLENE IN ANAEROBIC SOIL, Agricultural Research Council, Wantage (En-

gland). Letcome Lab. K. A. Smith, and S. W. F. Restall. Journal of Soil Science, Vol 22, No 4, p 430-443, December 1971. 7 fig, 3 tab, 31 ref.

Descriptors: \*Soils, \*Anaerobic conditions, \*Gases, \*Soil water, \*Crop response, Root development, Root zone, Testing, Analytical techniques, Crop production.
Identifiers: \*Ethylene, Waterlogged crops.

The production of ethylene and other hydrocarbon gases by soils under anaerobic conditions was measured by gas chromatography. Ethylene was the only hydrocarbon gas which occurred in physiologically significant concentrations; more than 20 ppm was found in several soils after 10 days at 20 deg C. These concentrations were considerably higher than those which were known to cause severe reductions in the extension of root axes of some plant species. Experiments with sterilized and unsterilized soil indicated that ethylene was produced by enzyme activity. The gas was found in soil when the oxygen concentration fell below 2%; total evolution was correlated with organic matter content, and was affected by drying and rewetting and by the growth of plant roots. The rate of production was increased by raising the temperature and by addition of glucose or peptone; high concentrations of nitrate depressed the rate, but sulphate and phosphate had little effect. Ethylene may be a significant factor in causing injury to crop plants under water-logged conditions and also in situations where anaerobic pockets occur within a mainly aerobic soil structure, provided that escape of the gas from the soil is impeded sufficiently to allow inhibitory concentrations to build up in the vicinity of plant roots. (Woodard-USGS) W72-05488

RENOVATING OLD CITRUS GROVES IN INDI-AN RIVER AREA

AN RIVER AREA,
IFAS Agricultural Research Education Center,
Lake Alfred, Fla.
For primary bibliographic entry see Field 03F.
W72-05573

MECHANIZED EXTRACTION AND CLEANUP OF ATRAZINE RESIDUES IN SOIL PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS, California Univ., Riverside. Dept. of Entomology. For primary bibliographic entry see Field 05A.

NITRATE IN DEEP SOIL PROFILES IN RELA-TION TO FERTILIZER RATES AND LEACHING VOLUME, California Univ., Riverside. Dept. of Soil Science.

California Univ., Riverside. Dept. of Soil Science For primary bibliographic entry see Field 05B. W72-05655

TRAVEL OF NITROGEN IN SOILS, Minnesota Univ., Minneapolis. Dept. of Civil Engineering.

For primary bibliographic entry see Field 05B. W72-05695 SIMULTANEOUS CYCLING OF PELTIER THERMOCOUPLE PSYCHROMETERS FOR RAPID WATER POTENTIAL MEASUREMENTS,

Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 07B. W72-05701

EVAPORATION FROM DRYING SURFACES BY THE COMBINATION METHOD, Wisconsin Univ., Madison. Dept. of Soil and Water Sciences. For primary bibliographic entry see Field 02D. W72-05702

VAPOR LOSSES THROUGH SOIL MULCH AT DIFFERENT WIND VELOCITIES, Punjab Agricultural Univ., Hissar (India). Dept. of Soils.

For primary bibliographic entry see Field 03B. W72-05705

RELATION OF WATER APPLICATION TO EVAPORATION AND STORAGE OF SOIL WATER,

Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 02D. W72-05706

ON SOLVING THE NON-LINEAR DIFFUSION EQUATION FOR THE RADIAL FLOW OF WATER TO ROOTS.

WATER TO ROOTS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.

J. B. Passioura, and I. R. Cowan. Agricultural Meteorology, Vol 5, 1968, p 129-134. 3 fig. 6 ref.

Descriptors: \*Diffusion, \*Soil water movement, \*Flow, \*Root systems, Model studies, \*Soilwater-plant relationships. Identifiers: \*Radial flow.

The non-linear diffusion equation for the radial flow of water to a root can be solved approximately by assuming that partial derivative of volumetric water content with respect time is either zero (steady state) or constant (steady rate). The accuracy of such solutions has been in doubt, so they are compared with exact solutions obtained numerically. The approximate solutions agree well with the numerical ones for biologically possible conditions. The 'steady rate' method is somewhat more accurate than the 'steady state' one. (Skogerboe-Colorado State) W72-05707

MODEL OF SOIL WATER USE BY TEA, La Trobe Univ., Bundoora (Australia). School of Agriculture. For primary bibliographic entry see Field 03F. W72-05713

CHEMICAL AND MINERALOGICAL COM-POSITION OF COMMON CHERNOZEMS ON THE RIGHT BANK OF THE VOLGA RIVER IN THE SARATOVE REGION UNDER DIFFERENT FARMLANDS, (IN RUSSIAN),

FARMLANDS, (IN RUSSIAN), V. G. Dikarev, and N. N. Poddubnyi. Dokl Mosk S-Kh Akad Im K A Timiryazev. 149. 165-170. 1969.

Identifiers: Analyses, Bank, Bulk, Chemical, Chernozems, Composition, Farmlands, Mineralogical, River, Saratov, Thermographic, USSR, Volga.

Comparisons were made of soils with similar profiles and texture, on virgin lands, old-cultivated lands, arable land tilled for 8 yr and a 42-yr-old shelterbelt. Data are given of bulk chemical and

thermographic analyses. No significant changes were noted in the composition of the clay frac-tion.—Copyright 1971, Biological Abstracts, Inc. W72-05714

CHESTNUT-SOLONETZ COMPLEXES OF THE ABAKAN STEPPES ON THE LEFT BANK OF THE YENISEI RIVER AND THE MINUSINSK N. I. Karnaukhov.

Izv Biol - Geogr Nauchno-Issled Inst Irkutsk

Univ. 21: 37-80. 1969. Identifiers: Abakan, Bank, Chemical, Chestnut, Complexes, Depression, Formation, Irrigation, Minusinsk, River, Soil, Solonetz, Steppes, USSR,

Soil cover of the Abakan steppes (the Uibat and he Koibaly steppes) preserves features of the rozen tundra permafrost and the meadow soil-fornation phases. The currently dominant phase is ne steppe phase of very marked arid character. The microcomplex nature of soil cover bears no relation to the relief. Solonetzes and chestnut soils are respectively formed in the presence and absence of clay intercalations in the parent rocks. The compact horizon with brown Fe cement saturated with CaCO3 occurring at depth 60-120 cm in chestnut soils is assumed to be a relic of hydromorphic conditions. Irrigation is the chief culture practice on the territory in question, ensur-ing high crop yields.--Copyright 1971, Biological Abstracts, Inc. W72-05716

#### FUNGAL GROWTH RESPONSES TO OSMOTIC AS COMPARED TO MATRIC WATER POTENTIAL,

Wisconsin Univ., Madison. For primary bibliographic entry see Field 02I. W72-05717

**PYROPHOSPHATE** HYDROLYSIS

FLOODED SOIL, Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences. For primary bibliographic entry see Field 05B. W72-05723

MICROMORPHOLOGICAL STRUCTURE OF DARK CHESTNUT SOILS ON THE RIGHT BANK OF THE URAL RIVER, (IN RUSSIAN), M. N. Pershina, E. A. Yarilova, and E. M.

Dokl Mosk S-Kh Akad Im K A Timirvazev, 149. 135-139, 1969.

Identifiers: Bank, Chestnut, Dark, Morphological, River, Soils, Structure, Ural, USSR.

The micromorphological structure, humus com-position and certain physicochemical properties of dark chestnut soils on a virgin plot and an irrigated plot are described.--Copyright 1971, Biological Abstracts, Inc. W72-05724

PHOSPHORUS DIFFUSION IN SOILS: I. THE EFFECT OF APPLIED P, CLAY CONTENT, AND WATER CONTENT,

Technology, Inc., Houston, Tex.
For primary bibliographic entry see Field 05B.

DATA ON THE DUNAMICS OF THAW TEM-PERATURE AND MOISTURE IN BOG SOILS IN THE SOUTH OF CENTRAL SIBERIA,

M. I. Petrauskaite, and Z. A. Sidorova. Izv Biol-Geogr Nauchno-Issled Inst Pri Irkutsk Univ. 21: 81-88, 1969.

Identifiers: Bog, Central, Dynamics, Grass-M, Legume-D, Moisture, Reclamation, Retention, Siberia, Snow, Soils, South, Temperature, Thaw,

Thaw in bog soils starts in Sept.-Oct. The thaw is complete in Aug. in thin beds of highly decomed peat. The temperature in July-Aug. does not rise above 15-19 deg. at a depth of 20 cm and 7-9 deg. at a depth of 50 cm. The moisture content is high, especially in the 0-50 cm layer. Cold bog soils are recommended for hayfields and perennial grass-legume mixtures. The thermal regime of reclaimed bog soils can be improved by snow retention to reduce freezing.--Copyright 1971, Biological Abstracts, Inc. W72-05726

COMPARATIVE PHYSICOCHEMICAL COMPARATIVE

PHYSICO-HEMICAL

DESCRIPTION OF LEACHED AND SOLONET
ZIC CHERNOZEMS IN THE ZALARI DIS
TRICT, IRKUTSK REGION, (IN RUSSIAN),

Z. A. Sidorova, E. I. Berezina, Y. U.

Kupriyanova, and N. N. Poguda

Izv Biol-Geogr Nauchno-Issled Inst Pri Irkutsk Univ. 21: 113-126. 1969.

Identifiers: Acids, Chernozems, Comparative, Description, Formation, Freezing, Fulvic, Humic, Insufficient, Irkutsk, Leached, Moisture, Physicochemical, Seasonal, Solonetzic, USSR, Weathering, Zalari.

Leached and solonetzic chernozems develop under the conditions of marked continental climate and cryogenic-type water regime (insufficient moisture and seasonal freezing with late thawing). Weathering is more intensive in the solonetzic than in the leached chernozem: Mg and Ca are respectively the dominant absorbed cations. The solonetzic chernozem contains some readily soluble salts, mostly Na2SO4. Humic acids predominate over fulvic acids in the organic matter of chernozems .-- Copyright 1971, Biological Abstracts, Inc. W72-05727

PERCHED WATER TABLE AND GROUND-WATER FLOW IN THE SOUTHERN PART OF THE FOREST ZONE (VERKHOVODKA I VNUTRIPOCHVENNYY STOK V YUZHNOY VNUTRIPOCHVEDINA, CHASTI LESNOY ZONY), CHASTI LESNOY ZONY), Nauchno-Issledovatel-

Skii Tsentr Leningrad (USSR).
A. I. Subbotin, and V. S. Dygalo.
Pochvovedeniye, No 5, p 46-57, May 1971. 2 fig, 2

tab, 10 ref

Descriptors: \*Perched water, \*Water table, \*Groundwater, \*Groundwater barriers, \*Base flow, Flow rates, Surface runoff, Runoff coefficient, Permeability, Percolation, Precipitation (Atmospheric), Thawing, Snowmelt, Freezing, Frozen soils, Soil horizons, Podzols, Loam, Forests, Flumes.

Identifiers: \*European USSR, Moscow River, Sod-Podzolic soils.

Investigations were conducted in 1956-69 at the Moscow water-balance station to study the perched water table and groundwater flow in Sod-Podzolic loam soils of the Moscow River basin. A temporary perched water table forms in these soils during spring snowmelt and heavy precipitation and is retained by the illuvial B horizon, which is far less porous than the overlying soil. A perched water table forms nearly every spring in the forests but does not form in open fields when the soil is excessively wet and frozen to great depths. The excess water flowing from upper soil layers during periods of thaw does not penetrate the frozen lower layers. During spring snowmelt, flow rates average 10%-15% of the total runoff from fields and 20%-30% of the total runoff from the forest. The ratio of surface runoff to groundwater flow depends largely on the state of the soil and on snowmelt conditions. A perched water table rarely forms in summer in the southern part of the forest zone of the European USSR, since the precipitation in this area is usually too small to saturate even the top soil layer. (Josefson-USGS) W72-05852

HYGROSCOPIC DETERMINATIONS OF SOIL WATER PRESSURE IN CERTAIN SOILS OF NORTH VIETNAM (DAVLENIYE POCHVEN-NOY VLACI V NEKOTORYKH POCHVAKH SEVERNOGO V'YETNAMA (PO DANNYM GIGROSKOPICHESKIKH OPREDELENIY)), Moscow State Univ. Faculty of Biology and Soil

Kong-Tau Tran.

Pochvovedeniye, No 6, p 121-130, June 1971. 2 fig,

Descriptors: \*Soil physics, \*Soil physical properties, \*Water pressure, \*Hygroscopic water, \*Soil water, Soil moisture, Moisture content, Humidity, Vapor pressure, Soil profiles, Soil types, Clays, Particle size, Hysteresis, Adsorption, Dehydra-

Identifiers: \*USSR, North Vietnam, Hygroscop-

The hygroscopic method was used to determine the relationship between soil moisture content and relative vapor pressure in several typical North Vietnamese soils, which were studied for the first time from this standpoint. Determinations were made on typical Dark-red Ferrallitic soil, Red-yellow Ferrallitic soil with a differentiated profile, and on alluvial soil underlain by ferrallitic material and severely degraded as a result of rice growing. linear relationship was established between the moisture content of these soils and their clay con-tent. Investigation of the relationship between soil moisture content and relative humidity revealed that it is linear for all of the soils examined. (Josef-W72-05853

MOVEMENT OF CHLORIDE AND SODIUM IONS IN UNSATURATED SOIL DURING EVAPORATION (PEREDVIZHENIYE IONOV KHLORA I NATRIYA V NENASYSHCHENNOY

POCHVE PRI ISPARENII), Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki Melioratsii, Moscow (USSR). For primary bibliographic entry see Field 02K. W72-05854

WATER EVAPORATION FROM SOILS OF THE SOLONETZ COMPLEX OF THE TRANSVOLGA REGION DURING IRRIGATION (ISPARENIYE PLEKSA ZAVOLZH'YA PRI OROSHENII),
Akademiya Nauk SSSR, Moscow. Pochvennyi In-

For primary bibliographic entry see Field 02D. W72-05855

EFFECT OF COMPACTION HYDRAULIC HYDRAULIC PROPERTIES (VLIYANIYE UPLOTNENIYA NA VODNYYE SVOYSTVA

POCHV), Agrofizicheskii Nauchno-Issledovatelsii Institut, Leningrad (USSR).

V. G. Onishchenko, and B. N. Michurin. Pochvovedeniye, No 5, p 42-46, May 1971. 4 fig, 9

Descriptors: \*Soil physics, \*Soil physical properties, \*Soil compaction, \*Soil density, \*Bulk density, Hydraulic properties, Soil water, Soil moisture, Moisture content, Water pressure, Porosity, Pores, Equilibrium, Adsorption, Satura-tion, Sands, Loam, Podzols, Sierozems, Chrenozems.
Identifiers: \*USSR.

Samples of clay-free sand, coarse and medium Podzol loam, coarse Sierozem loam, and Chernozem were analyzed to determine the effect of compaction on the relationship between soil moisture content and water pressure. The ratio of pore surface to pore volume increased with in-creasing specific surface and soil bulk density. Equilibrium moisture decreased in the pressure range < 0.33-1.0 atm with increasing soil bulk den-

#### Group 2G-Water in Soils

sity because of a reduced effective pore diameter. Equilibrium moisture increased in the pressure range > 0.33-1.0 atm because of a wider pore surface to pore volume ratio. The amount of available water in sandy soils remained practically the same when bulk density from 1.5 to 1.8 g/cu cm. In finetextured soils the amount of available water was maximal in the bulk density range from 1.1 to 1.3 g/cu cm and decreased in the bulk density range > 1.3-1.4 g/cu cm. An inverse linear relationship (on the logarithmic scale) between the soil moisture saturation coefficient and suction pressure was obtained for all soils examined. (Josefson-USGS) W72-05856

WATER REGIME OF ORDINARY CHER-NOZEMS UNDER CROPS IN THE CROPS IN OBLAST (VO THE VOROSHILOVGRAD (VODNYY REZHIM CHERNOZEMOV OBYKNOVEN-NYKH POD SEL'SKOKHOZYAYSTVENNYMI KUL'TURAMI V VOROSHILOVGRADSKOY OBLASTI).

Selskokhozyaistvennyi Institut, Lugansk (USSR). L. I. Akent'yeva.

Pochvovedeniye, No 6, p 69-79, June 1971. 12 tab, 2 ref.

Descriptors: \*Soil physics, \*Soil physical properties, \*Chernozems, \*Cereal crops, \*Water balance, Soil water, Moisture availability, Water storage, Water supply, Water loss, Evapotranspiration, Crop production, Barley, Wheat, Corn (Field), Fallowing, Calcareous soils, Loam, Meteorological data, Seasonal.
Identifiers: \*USSR, \*Ukraine, Lugansk Oblast, Fallow, Coefficient of correlation.

Investigations were conducted in 1958-67 by the Lugansk Agricultural Institute (formerly Voroshilovgrad Agricultural Institute) to study the water balance in bare fallow and in Ordinary Chernozems under the principal crops grown in the dry climate of the Lugansk Oblast (formerly Voroshilovgrad Oblast) in the Eastern Ukraine. Storage of available soil water in spring plays an important role in the water supply of crops which cease to grow in late June and early July. A close relationship was observed between barley and winter wheat yields and soil water storage in spring, the correlation coefficients being +0.97 and +0.95. A high correlation coefficient of +0.98 was also observed between the amount of fall precipitation (August through December) and the available water in spring. Precipitation from January through April was less important for spring water storage, the correlation coefficient being +0.66. Correlation coefficients between precipitation during the growing season (April through June) and winter wheat and barley yields were lower than spring water storage in soil (+0.49 and +0.59, respectively). Unlike crops which cease to grow in June, corn depends mainly on precipitation during its growing season and primarily on that in June and July. The correlation coefficient between precipitation during this period and corn yield was +0.94. Total water loss (transpiration and evaporation from the surface) per unit of crop yield averaged 12-13 mm for winter wheat and barley and 15 mm for corn. (Josefson-USGS) W72-05857

PRESSURE PLATE APPARATUS PLOTTING DELTA P ± F (W) CURVES BY MEASUREMENT VOLUMETRIC MOISTURE (PLASTINCHATYY PRESS DLYA SNYATIYA KRIVYKH DEL'TA P ± F (W) S OB-YEMNOY REGISTRATSIYEY VLAZHNOSTI), Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).

For primary bibliographic entry see Field 07B.

SNOWMELT TEMPERATURE INFLUENCE ON INFILTRATION AND SOIL WATER RETEN-TION

Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab. G. O. Klock.

Journal of Soil and Water Conservation, Vol 27, No 1, p 12-14, January-February 1972. 3 fig, 6 ref.

Descriptors: \*Infiltration, \*Water temperature, \*Snowmelt, Permeability, Viscosity, Hydraulic conductivity, Density, Soil water movement, Soil moisture.

The infiltration of water near snowmelt temperature (0 deg C) into a column of soil was one-half the rate of water at 25 deg C. Increasing the temperature of a drained soil column near 0 deg C to a higher temperature resulted in additional soil water drainage and a significant decrease in the amount of water held by the soil. Watershed management implications include recognizing possible overland flow hazards and effects of thinning, clearcutting, and wildfire. (Knapp-USGS) W72-05866

#### 2H. Lakes

PRINCIPAL TYPES OF LAKES IN KARST RE-GIONS (OSNOVNYYE TIPY KARSTOVYKH RAYONOV), K. A. Gorbunova, and G. A. Maksimovich.

Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva, Vol 102, No 3, p 258-263, May-June 1970. 2 fig, 1 tab, 36 ref.

Descriptors: \*Lakes, \*Lake basins, \*Lake \*Karst, morphology, \*Topography, Geomorphology, Chemical precipitation, Corrosion, Erosion, Drainage effects, Subsurface drainage, Groundwater, Sinks, Limestones, Calcium carbonate, Travertine.

Identifiers: \*USSR, Yugoslavia, Karstic rocks, Depressions, Kettles, Windows, Poljes, Tufa, Colmatage, Mineralization.

The principal genetic types of lakes in karst re-gions of the USSR are examined on the basis of personal observations and data in the literature. The lakes are found in regions with carbonate, sulfate, and saline karst whose origin, development, and water regime are closely associated with karst processes. Lake basins of karst regions may be divided into 3 groups, depending on the extent of karst participation in formation of the lake basin and on the direction of the karst process (removal or accumulation of material): (1) karst and tectonic-karst lake basins, including karst funnels, kettles, depressions, and poljes (open, flat-floored valleys), formed by leaching of karstic rocks at or below the surface; (2) dammed lake basins, formed on karst rivers when tufa is deposited across them as a result of calcium carbonate precipitation from the water; and (3) karstmodified and complex lake basins, formed under influence of several exogenous geological processes with karst participating to varying degrees. Karst-modified basins include those originally of nonkarst origin but subsequently complicated by karst. These are erosion-karst, glacial-karst, anthropogenic-karst and other lakes. The contributing basins, water regime, temperature, chemistry, and evolution of karst lakes deserve special investigation and further analysis. (Josefson-USGS) W72-05352

MATHEMATICAL MODEL OF WATER QUALITY IN AN IMPOUNDMENT, Washington State Water Research Center, Pullman.

For primary bibliographic entry see Field 05B. W72-05454

SEASONAL VARIATION IN PRIMARY PRODUCTIVITY IN THREE TROPICAL PONDS, Madurai Univ. (India). Dept. of Biological Sciences. For primary bibliographic entry see Field 05C. W72-05460

LAKE KINNERET: THE NUTRIENT CHEMIS-TRY OF THE SEDIMENTS, Kinneret Limnological Lab., Tiberias (Israel). For primary bibliographic entry see Field 05C. W72-05469

CHANGES IN THE FISH POPULATION IN LAKE FRANCIS CASE IN SOUTH DAKOTA IN THE FIRST 16 YEARS OF IMPOUNDMENT, Bureau of Sport Fisheries and Wildlife, Yankton, S. Dak. North Central Reservoir Investigations. Charles R. Gasaway.
Technical Paper No. 56. 1970. Illus. Map Identifiers: Bass, Bluegill, Carp, Catfish, Chub, Fish, Francis, Goldeye, Impoundment, Lake, Perch, Pike, Population, Sauger, Shad, Shiner, South-Dakota, St, Walleye.

The total number of adult fish in Lake Francis Case, a main stem Missouri River Reservoir, has declined since impoundment in 1952. Goldeye, channel catfish, and northern redhorse have probably remained the same; emerald shiner, white bass, walleye, and possibly flathead catfish have increased. The sauger population began to decline at about the time walleye numbers increased. Some species formerly present in small numbers have become rare: flathead chub, stonecat, black bullhead, largemouth bass, green sunfish, organespotted sunfish, and bluegill. The catch rate by sport fishermen in the reservoir declined from 1954 to 1960. Growth of northern pike, river carpsucker, largemouth bass, walleye, and sauger was faster than in most other U.S. waters at this latitude; carp and freshwater drum growth was slower. For 13 spp. for which preimpoundment growth estimates were available, growth increased after impoundment but later declined. Forage species in the reservoir were gizzard shad, emerald shiner, and yellow perch, but these were not present in large enough numbers to provide an abundant forage fish population. Echo sounding and midwater trawling in 1968 indicated that the pelagic zone contained few Reproduction was successful in 1953 and 1954 for gizzard shad, goldeye, northern pike, most catostomids, carp, most centrarchids, sauger, and drum; reproduction was good for many species in 1967, a year of high water levels, reproduction of walleye, white bass, drum, and emerald shiner was more successful in 1966-68 than in most previous years.--Copyright 1971, Biological Abstracts, Inc. W72-05475

SHORELINE-AREA RATIO AS A FACTOR IN RATE OF WATER LOSS FROM SMALL SLOUGHS, Wildlife Service, Canadian Saskatoon (Saskatchewan).
For primary bibliographic entry see Field 02D. W72-05481

BIOGENOUS SUBSTANCES IN DEEP WATERS OF THE CASPIAN SEA (BIOGENNYYE ELE-MENTY V VODAKH GLUBOKOVODNOY CHASTI KASPIYSKOGO MORYA), State Oceanographic Inst. Moscow (USSR). For primary bibliographic entry see Field 02K. W72-05504

LOSS LEVELS, United States Lake Survey, Detroit, Mich. For primary bibliographic entry see Field 06E. W72-05579

EUTROPHICATION (THE AGEING OF LAKES), A FLORIDA WATER QUALITY PROBLEM.

Florida Dept. of Air and Water Pollution Control, Tallahassee.

For primary bibliographic entry see Field 05C. W72-05607

## THUNDER BAY: AN EXAMPLE OF A SILLED FRESH-WATER BAY, Lakehead Univ., Port Arthur (Ontario).

J. S. Mothersill. Journal of Sedimentary Petrology, Vol 41, No 4, p 1073-1083, December 1971. 7 fig, 1 tab, 14 ref.

Descriptors: \*Bottom sediments, \*Lake Superior, \*Oxidation-reduction potential, \*Water pollution effects, Distribution patterns, Mineralogy, Diagenesis, Sedimentation, Glacial drift, Organic matter, Topography.
Identifiers: Thunder Bay (Ontario).

Thunder Bay, Lake Superior is partly silled to the south by an east-northeast trending horst, and contains three separate basins. Recent sediments, which cover the bay-floor, grade from a thin veneer of sand less than 3 centimeters thick along the bay-shelf, to a sequence of clay-silts up to 14 meters thick in the central parts of the basins. meters thick in the central parts of the basins. Tight folding of the Recent clay-silts in the deepest part of the central basin is probably caused by downslope slumping. A tendency towards negative Eh and low pH values appears in the deep-water areas. In the vicinity of the Kaministikwia Delta, anomolously negative Eh and high pH measure-meters are bothly enough by industrial politors. ments are probably caused by industrial pollutants entering the bay from the Kaministikwia River. The Recent sediments unconformably overlie Pleistocene varved sediments of undetermined thickness. The Recent clay-silt section and the Pleistocene varved section each form a typical syndiagenetic sequence with a relatively thin, upper oxidized zone (initial stage), and a lowe reduced zone (early burial stage). (Knapp-USGS)

# A PREURBANIZATION RECONNAISSANCE STUDY OF LAKE EARL, DEL NORTE COUN-

Geological Survey, Menlo Park, Calif. E. J. Helley, and R. C. Averett.

Geological Survey Open-file Report, December 3, 1971. 17 p, 1 fig, 4 tab, 8 ref.

Descriptors: \*Lakes, \*California, \*Urbanization, \*Surveys, \*Hydrologic data, \*Eutrophication, Flood plains, Dunes, Silting, Water quality, Recreation, Limnology. Identifiers: Urban hydrology.

Lakes Earl and Talawa occupy shallow depressions on the Smith River plain, an emerged Pleistocene marine terrace just south of the mouth of the Smith River in north-coastal California. of the Smith River in north-coastal Cautornia. Since the depth to groundwater in the immediate vicinity of Lake Earl is shallow, groundwater discharge probably sustains the lake level during periods of low surface-water discharge. Land development is planned on the north shore of the lake. With increased urbanization, more use will be made of the lake. The possibility of urbaniza-tion of the north shore of Lake Earl has increased concern about the stability of the dunes bordering the lake, as well as the future water quality in the lake. The naturally enriched status of Lake Earl is attested by the profuse rooted plant beds on its bottom, the extensive rush beds along its shores, and the organic carbon content of its bottom sediments. (Knapp-USGS) W72-05646

## AN INVESTIGATION OF PRIMARY PRODUC-TIVITY USING THE 14C METHOD AND AN ANALYSIS OF NUTRIENTS IN ELEPHANT

BUTTE RESERVOIR, New Mexico State Univ., University Park. Water Resources Research Inst.

For primary bibliographic entry see Field 05C.

## LIFE HISTORY OF RAINBOW TROUT (SALMO GAIRDNERI) IN BATCHAWANA BAY, EAST-ERN LAKE SUPERIOR, Department of Lands and Forests, Sault Sainte

Marine (Ontario). Research Branch.

Wen-Hwa Kwain Fish Res Bd Can. 28 (5): 771-775. 1971. Illus.

Map.
Identifiers: Batchawana, Bay, Canada, Eastern,
History, Lake, Lamprey, Life, Marks, Rainbow,
Readings, Salmo-Gairdneri, Scale, Superior,

The life history of a S. gairdneri population was in-ferred from scale readings from the years 1967-70. Of 461 scale samples examined, 58% were from fish spending 2 yr in the stream, 38% were 1 yr in the stream, and 4% were 3 yr in the stream. Three-and 4-yr-old trout formed the bulk of the spawning population. Fish descending early to the lake wer significantly larger at maturity than fish descending later in life. No apparent size difference between sexes was found; fish generally spent 2 yr in the lake to reach sexual maturation. In the spawning population, 68% were maiden spawners and 26% were spawning for a 2nd time. A five-time spawner was recorded. The incidence of lamprey spawier was recorded. The incidence of lamprey marking of rainbow trout was 15% (1969) and 14% (1970). Ninety percent of lamprey-marked trout were larger than 450 mm in fork length and had lived in the lake for 2 or more consecutive years.—Copyright 1971, Biological Abstracts, Inc. W72-05697

# BIOLOGY OF THE SMALL PELAGIC FISHES IN THE NEW VOLTA LAKE IN GHANA: II. SCHOOLING AND MIGRATIONS,

Ghana Univ., Legon. Volta Basin Research Pro-

Julian D. Reynolds. Hydrobiologia, 38 (1): 79-91. 1971. Illus. Maps. Identifiers: Biology, Catch, Fishes, Ghana, Lake, Migrations, Pelagic, Periodicity, Schooling, Volta.

Five spp. of small pelagic fishes in the new Volta Lake in Ghana showed a dual periodicity in catches, and were strongly attracted to light. As these forms occur typically in rivers, their school formation and migratory movements were investigated, and their purposes are discussed. It apvestigated, and their purposes are discussed. It appears that a duel vertical movement occurs so that the fish can exploit a feeding ground at its richest moments, and at times when they are least conspicuous to predators. The school is the normal method of migrating, as it confers protection against predators. Once the fish cease to move, however, the school loses its coherence and its individual difference. Leafiner, withdraw in the dividuals disperse. Indirect evidence is also presented that in 3 spp. a longitudinal upstream presented that in 3 spp. a longitudinal upstream migration may occur, probably to breed after the rains, and in 2 others, there may be lateral move-ment into prevailing winds.—Copyright 1971, Biological Abstracts, Inc.

## A MARK-RECOVERY METHOD FOR ESTI-MATING ANGLER'S CATCH, WITH AN EX-AMPLE FROM LAKE OPEONOGO, ONTARIO, Toronto Univ. (Ontario). Dept. of Zoology.

Henry A. Regier. Trans Am Fish Soc. 100 (3): 495-501. 1971. Map. Identifiers: Anglers, Canada, Catch, Lake, Mark, Method, Ontario, Opeonogo, Petersen, Recovery.

Estimates of angler's catch in complex lake-spe cies-angler systems are usually obtained with ratio estimators using data on effort as a covariate, together with an estimate of the catch-per unit-effort ratio. Practical and theoretical studies show that this approach can be expected to be very costly if estimates with useful precision are sought. The study shows the practical feasibility of using a Petersen mark-recovery method for this

worker to roam the lake contacting anglers 'at ran-dom' and marking fish already creeled with a small but readily retrievable tag. The 2nd part involves in-shore or on-shore workers who intercept an-glers 'at random' as they leave the lake and obtain from them data on marked and unmarked fish in their catch. The extensive literature on mark-recovery methods is directly relevant to this application of the technique .-- Copyright 1971, Biological Abstracts, Inc. W72-05736

# STUDIES ON THE OPEN AIR BIOLOGY OF SALMONELLAE IN THE REGION OF THE WESER-LEINE RIVERS 1964-67,

Niedersaechsiches Landesmuseum Hannover (West Germany). For primary bibliographic entry see Field 05C. W72-05802

## HYDROLOGY AND GEOCHEMISTRY OF ABERT, SUMMER, AND GOOSE LAKES, AND OTHER CLOSED-BASIN LAKES IN SOUTH-CE-

OTHER CLOSED-BASIN LAKES IN SOUTH-CE-NTRAL OREGON, Geological Survey, Washington, D.C. K. N. Phillips, and A. S. Van Denburgh. Available from GPO, Washington, DC 20402 -Price \$1.75 (paper cover). Geological Survey Professional Paper 502-B, 1971. 86 p, 37 fig, 2 plate, 31 tab, 49 ref.

Descriptors: \*Lakes, \*Hydrology, \*Geochemistry, \*Water analysis, \*Oregon, Chemical analysis, Saline lakes, Inflow, Overflow, Hydrologic data, Saline lakes, ....
Data collections.
\*Closed-basin

lakes (Oreg).

Topographically enclosed fault-block basins in the semidesert region of south-central Oregon contain lakes whose volumes have fluctuated in response to changes in water supply (precipitation plus in-flow) and water loss. Most of the lakebeds are impermeable and the water is dissipated only by evaporation or, for some lakes, occasional overflow. Physical, hydrologic, and chemical data for the lakes are summarized. For all but the freshest closed lakes, sodium and potassium were by far the most abundant cations. Measured epm (equivalents per million) percentages for the two ions together ranged from 46% of the cations in Crump Lake at 332 ppm (parts per million) of dis-solved solids to 99.99% in Lake Abert at 20,000-80,000 ppm. Among the anions, carbonate bicarbonate ranked either first or a close second in all the lakes, with the relative (percentage) amounts decreasing as dissolved-solids concentration in-creased the epm-percentage ranged from about 80 in Crump Lake to about 40 in Lake Abert. Among the minor constituents, silica was generally the most abundant. As much as 200 ppm of silica was measured in Abert and Summer Lakes. (Woodard-USGS) W72-05846

## DELTAIC SEDIMENTATION IN GLACIAL LAKE DOUGLAS, Illinois State Geological Survey, Urbana

For primary bibliographic entry see Field 02J. W72-05863

#### STEPHENSON COUNTY SURFACE WATER RESOURCES, Illinois Dept. of Conservation, Springfield. Div. of

Fisheries. T. B. Miller.

Illinois Division of Fisheries Report, August 1971. 50 p, 14 fig, 8 tab, 4 append.

Descriptors: \*Surface waters, \*Lakes, \*Streams, Descriptors: "Surface waters, Lakes, Streams, "Illinois, "Reviews, Recreation, Fishing, Swimming, Documentation, Water quality, Water pollution sources, Geology, Data collections. Identifiers: "Stephenson County (III).

#### **Group 2H—Lakes**

As of January 1, 1970, there were 118 impoundments in Stephenson County, Illinois, with a total surface area of 228.6 acres. The 9 streams in the county have a total surface area of 839.1 acres. This is a combined area of 1,067.7 acres of water or only 0.3 percent of the total surface area of the county. The ponds and lakes provide largemouth bass and bluegill fishing, while the streams provide fishing for smallmouth bass and channel catfish. The Pecatonica River also provides occasional walleye and northern pike fishing. The surface waters are highly fertile, relatively hard, and very productive. Major water pollution problems are limited to domestic and industrial pollution in the Pecatonica River and in localized areas of several other streams. Water usage is still another important parameter of water quality; camping and stream fishing are the major water-based activities in Stephenson County. (Woodard-USGS) W72-05867

MOULTRIE COUNTY SURFACE WATER RESOURCES.

Illinois Dept. of Conservation, Springfield. Div. of

R. W. Horner.

Illinois Division of Fisheries Report, July 1971. 47 p, 16 fig, 5 tab, 14 ref.

Descriptors: \*Surface waters, \*Lakes, \*Streams, \*Illinois, \*Reviews, Recreation, Fishing, Boating, Swimming, Water quality, Geology, Water pollu-tion sources, Documentation, Data collections. Identifiers: \*Moultrie County (III).

The total water impoundment in Moultrie County, Illinois, is 5,754.3 acres. There are 38.5 miles of major streams, with a surface area of 119.8 acres. Of the total impoundment acreage, 97.2% is water for public use. Organizations own another 0.4% and 2.4% is privately owned. A water inventory of the county is tabulated including a breakdown of size and ownership categories of impoundments. The most important lake in the county of public recreation is Shelbyville Reservoir and the most important stream is the Kaskaskia River. Construction of new impoundments occurs at the rate of 8 to 10 per year. The pH of surface water is variable, but stays within a given range (7.6 to 9.0) unless the body of water is polluted by some acid or alkali. The pH of impounded water sometimes tends to be more alkaline than that of flowing water, due to the activity of aquatic weeds. The Kaskaskia River has suffered repeated fish kills from various types of pollution. Some of these have been due to oxygen depletion and others due to chemicals poisonous to fish life. (Woodard-W72-05868

GREENE COUNTY SURFACE WATER RESOURCES,

Illinois Dept. of Conservation, Springfield. Div. of Fisheries. R. Lockart.

Illinois Division of Fisheries Report, August 1971. 44 p, 5 fig, 12 tab, 12 ref.

Descriptors: \*Surface waters, \*Lakes, \*Streams, \*Reviews, \*Illinois, Recreation, Fishing, Swimming, Boating, Documentation, Water quali-ty, Silting, Agricultural chemicals, Water pollution sources, Algae, Geology, Data collections Identifiers: \*Greene County (Ill).

Greene County, Illinois, has a total surface water inventory of 1,136.0 acres of lakes and ponds and 494.70 acres of named streams. The largest single water area (58.8 acres) in Greene County is Greenfield City Lake. The main drainage systems are Apple Creek in the northern part of the county and Macoupin Creek in the southern part of the county. Most of the streams in Greene County are slow moving. The two exceptions to this are Hurricane Creek and Wolf Run. Flooding on all streams is a yearly occurrence during the spring rains. Along the Illinois River and Apple Creek floodplain

drainage is a major problem. Many canals and ditches have been constructed in these two areas. Siltation occurs in all of the slower moving streams and is the main source of water pollution in Greene County. The impoundments and streams are medium hard in alkalinity. The hardness ranges from 125 to 350 ppm. pH values range from 7.4 to 8.0. Most of the lakes and ponds contain some species of sport fish such as largemouth bass, bluegill, channel catfish, and bullheads. (Woodard-USGS) W72-05869

AQUATIC PLANTS FROM MINNESOTA PART - CHEMICAL SURVEY,

Minnesota Univ., Minneapolis. Water Resources Research Center. For primary bibliographic entry see Field 02K. W72-05877

#### 2I. Water in Plants

AN EXPERIMENTAL INVESTIGATION INTO THE EFFECTS OF FLOODING ON THE IX-ODID TICK BOOPHILUS MICROPLUS (CANESTRINI),

Commonwealth Scientific and Industrial Research Organization, Indoorpoopilly (Australia). Div. of

Entomology. R. W. Sutherst.

Oecologia. 6 (3): 208-222. 1971. Illus. Identifiers: Boophilus-Microplus, Dynamics.

Flooding, Ixodid, Population, Tick.

The effect of water immersion on the non-parasitic stages of B. microplus were investigated both under laboratory and field conditions. Survival of engorged female ticks was influenced by their age and the temperature of the water. Eggs and larvae were more resistant to submersion than were en-gorged females and their survival was increased at low temperatures and in water with high O2 content. The persistence of this tick in areas prone to flooding was attributed to the survival of parasitic stages and to larvae on the pasture. Heavy rains produce favorable pasture conditions for tick reproduction so that a large increase in population size may be expected to follow such rain.—Copyright 1971, Biological Abstracts, Inc. W72-05279 72-05279

STUDIES ON MOISTURE RELATIONSHIPS OF SOME AQUATIC AND TERRESTRIAL ALGAE, Christ Church Coll., Kanpur (India).

Hydrobiologia. 37 (2): 211-213. 1971. Illus.

Identifiers: Algae, Aquatic, Lyngbya-Arboricola, Moisture, Oedogonium-Sp. Relationships, Terrestrial, Vaucheria-Hamata.

Significant variations among aquatic and terrestrial algae (Lyngbya arboricola, Oedogonium sp. and Vaucheria hamata) in moisture and hydration percentage were observed. Both percentages proved to be significantly higher in the aquatic forms.--Copyright 1971, Biological Abstracts, Inc. W72-0536.

(+)-ABSCISIC ACID CONTENT OF SPINACH N RELATION TO PHOTOPERIOD AND WATER STRESS.

Michigan State Univ., East Lansing, For primary bibliographic entry see Field 03F. W72-05364

AN ERROR IN THE CALIBRATION OF XYLEM-WATER POTENTIAL AGAINST LEAF-

-WATER POTENTIAL, Monash Univ., Clayton (Australia). Dept. of Botany. D. W. West, and D. F. Gaff.

J Exp Bot. 22 (71): 342-346. 1971. Illus. Identifiers: Apparatus, Calibration, Chamber, Error, Leaf, Potential, Pressure, Stress, Xylem.

An error occurs in the calibration of xylem pressure potential against leaf-water potential when the calibration is made using plant material in which the water stress has been induced artifi-cially after excision. The imposition of water stress after excision affects the xylem pressure potential determination more than it affects leafwater potential; consequently the relationship between these 2 indices of water stress is altered. between these 2 indices of water stress is altered. Care should be exercised to ensure that identical procedures are adopted during xylem pressure potential vs leaf-water potential calibrations and during subsequent field measurements of xylem pressure potential with the pressure-chamber apparatus.—Copyright 1971, Biological Abstracts, Inc.

W72-05367

EFFECT OF ENVIRONMENT ON THE ACTIVITY OF DIPHENAMID,
Cornell Univ., Ithaca, N.Y. Dept. of Vegetable

Crops. For primary bibliographic entry see Field 02F. W72-05370

EFFECT OF SOIL FUMIGATION AND 6 SOIL WATER REGIMES ON MINERAL CONTENT

OF CARROTS,
Department of Agriculture, Agassiz (British Columbia). Research Station.
For primary bibliographic entry see Field 03F. W72-05386

THE DIFFERENTIATION OF THE AM-PHIPODA IN RELATION TO THE GEOLOGI-CAL CHANGES AND THE DEVELOPMENT OF THE MODERN DANUBE HYDROLOGICAL SYSTEM IN EASTERN SERBIA,

Belgrade Univ. (Yugoslavia). Zoology Inst. M. A. Pljakic.

Z Zool Syst Evolution-Forsch. 9 (2): 156-158. 1971. **English summary** 

Enguist summary. Identifiers: Amphipoda, Danube, Development, Differentiation, Eastern, Geological, Hydrologi-cal, Karstification, Niphargus, Relation, Serbia,

Eastern Serbia was covered during the Miocene by the Sarmatian Sea. Therefore, the fauna of Amphipoda contains such elements which today are widely distributed in the Ponto-Caspian zone. As the result of regression of the Sarmatian Sea the Danube came into existence. Only those elements of the rich Ponto-Caspian fauna which were able to adapt themselves to the new conditions of strongly running water survived. Tributaries on the right side of the Danube changed their length repeatedly. Elements of the old warm and cold ving Balkanian fresh water fauna invaded these tributaries, e.g. 2 spp. of the subgenus Rivulogam-marus. As the result of karstification of the region in question stepwisely subterranean rivers were formed. Representatives of the cavernicolous genus Niphargus show differentiation on the specific or subspecific level horizontally as well as vertically.—Copyright 1971, Biological Abstracts, W72-05389

EMERGENCE PATTERNS OF SOME PLECOP-TERA IN TWO MOUNTAIN STREAMS IN AL-

D. S. Radford, and R. Hartland-Rowe. Can J Zool. 49 (5): 657-662. 1971. Illus.

Identifiers: Alberta, Canada, Emergence, Mountain, Patterns, Photoperiod, Plecoptera, Streams, Temperature.

The seasonal distribution of Plecoptera in 2 mountain streams in Alberta (Canada) is presented and compared with emergence patterns in the northwestern USA and southern British Columbia. Differences between the emergence periods in out study are attributed to differences in the amount of heat the streams accumulated. Some general aspects of the emergence pattern peculiar to the

region, and its relation to the interaction between photoperiods and water temperature are discussed.--Copyright 1971, Biological Abstracts, Inc. W72-05390

HYDROMEDUSAE MITROCOMELLA POLYDIADEMATA AND M. CRUCIATA AS IN-DICATORS OF BOREAL AND ARCTIC

WATERS, Moscow State Univ. (USSR). For primary bibliographic entry see Field 02C. W72-05391

EFFECTS OF SOME EXTERNAL BIOTIC FAC-TORS UPON THE JUVENILE GROWTH OF TWO POECILIDAE, Ecole National Superieure Agronomique, Tou-

louse (France). R. Quillier.

Ann Hydrobiol. 1 (1): 55-72. 1970. Illus. English

Identifiers: Biotic, External, Gambusia-Affinis, Growth, Inhibition, Juvenile, Poecilia-Reticulata, Poecilidae, Self, Stimulation.

Mechanisms controlling growth rate other than food, such as self-inhibition and self-stimulation as observed in Gambusia affinis and Poecilia reticulata, are discussed .-- Copyright 1971, Biological Abstracts, Inc.

THE EFFECT OF DRY CRUSHING AND WET PUDDLING TREATMENTS ON THE PHYSICAL PROPERTIES WILTING POINT AND ROOT GROWTH IN A SANDY LOAM AND A SILTY CLAY SOIL.

Cairo Univ. (Egypt). Faculty of Agriculture. For primary bibliographic entry see Field 02G. W72-05402

THE OCCURRENCE OF ETHYLENE IN ANAEROBIC SOIL,

Agricultural Research Council, Wantage (England). Letcome Lab. For primary bibliographic entry see Field 02G. W72-05488

OZONE RESISTANCE IN TOBACCO PLANTS: A POSSIBLE RELATIONSHIP TO WATER BALANCE,
California Univ., Riverside. Dept. of Life

Irwin P. Ting, and W. M. Dugger. Atmos Environ. 5 (3): 147-150. 1971. Illus. Identifiers: Air, Balance, Carbohydrate, Ozone, Plants, Pollutant, Relationship, Resistance, Tobacco-D.

The tobacco cultivars Bel-W3 (ozone sensitive) differ in general water balance. A significantly small root system of Bel-B results in slower rates of water transport to aerial parts such that in light leaf resistances to water vapor transfer are higher and leaf water potentials are lower in Bel-B than in Bel-W3. The known relationship between soluble carbohydrate content, ozone sensitivity, and low water potential suggests a possible basis for ozone resistance in Bel-B. These observations may be important in the selection of economically important plants .-- Copyright 1971, Biological Abstracts, W72-05534

A FRESH-WATER ARCHIANNELID FROM THE COLORADO ROCKY MOUNTAINS, Colorado Univ., Boulder. Div. of Environmental

Biology. Robert W. Pennak.

Trans Am Microsc Soc. 90 (3): 372-375. 1971. Identifiers: Archiannelid, Colorado, Fresh, New, Record, Rocky Mountains.

The archiannelid Troglochaetus beranecki is reported from the interstitial water of gravel substrates in Colorado mountain streams. It was previously known only from central Europe. Evidence shows that it is an archaic species with very slow geographical spread.—Copyright 1971, Biological Abstracts, Inc. W72-05557

OSMOREGULATORY CAPABILITY IN JU-VENILE SOCKEYE SALMON (ONCOR-HYNCHUS NERKA), National Marine Fisheries Service, Auke Bay,

Alaska. Biological Lab. Jack E. Bailey.

Can J Zool. 49 (6): 841-845. 1971.

Identifiers: Capability, Oncorhynchus-Nerka, Regulatory, Salinity, Salmon, Sockeye, Sockeye, Tolerance

The osmoregulatory capability of O. nerka embryos and fry was tested at weekly intervals by exposing them for 5 days to seawater with a salinity of 29%. Juveniles that survived the 5-day test were considered to be euryhaline. The fry acquired a salinity tolerance in March 1968 when they were 64 days old and less than 35-40 mm long. The juvenile salmon retained the ability to survive direct transfer to seawater during the 12-mo period following March 1968.—Copyright 1971, Biological Abstracts, Inc. W72-05595

STUDIES ON THE BIOLOGY OF SOME FRESHWATER FISHES. PART VI. MYSTUS

CAVASIUS (HAM.), National Inst. of Oceanography, Panajim (India). V. S. Bhatt.

Hydrobiologia. 38 (2): 289-302. 1971. Illus. Identifiers: Biology, Feeding, Fishes, Fresh, Mystus-Cavasius, Rate, Seasonal, Spawning.

The biology of a freshwater fish, M. cavasius with particular reference to its length frequency, breeding and food are described. Length frequency distribution gave an indication of 4 modes during the quarter, July-Sept. Both sexes attain maturity when they are approximately 10 cm long. Females grow larger than the males and are more abundant grow larger than the males and are more abundant in the population. The spawning of this fish seems to take place during Aug. and Sept. Maturing ovaries of females show only I batch of eggs which is probably shed in a single spawning act. The condition factor of the fish has no correlation either with the seasonal changes in maturity or with the feeding rhythm. The fish has an omnivorous habit and consumes all types of food available in the habitat. The feeding is high during the monsoon and winter months and low during the summer months.--Copyright 1971, Biological Abstracts, Inc. W72-05598

FECUNDITY OF ATLANTIC SALMON (SALMO SALAR) FROM TWO MAINE RIVERS, Maine Univ., Bangor. Atlantic Sea Run Salmon

Commission.
E. T. Baum, and A. L. Meister.
J Fish Res Bd Can. 28 (5): 764-767. 1971.

Identifiers: Atlantic, Deposition, Egg, Fecundity, Maine, Rivers, Salmo-Salar, Salmon.

Estimates of numbers of eggs in 164 hatchery-spawned Atlantic salmon (Salmo salar) from 2 Maine rivers ranged from 3528 to 18,847, and egg number per pound of total body weight from 523 to 1385. Sample autopsies of 10 salmon revealed that artificial spawning researched artificial spawning removed an average of more than 97% of the eggs in the body cavity. There was no significant difference between von Bayer and displacement estimates of fecundity. Valid estimates of the potential egg deposition of Atlantic salmon runs in the two Maine rivers can be made using routinely collected trapping data and the regression formulae based on fish length resulting from this study. Salmon that spent 2 yr at sea before spawning contained lower total numbers of eggs but appeared to have a higher rate of fecundi-ty than older fish. Factors governing egg size could not be isolated. Loss in body weight during spawning is discussed.—Copyright 1971, Biological Abstracts, Inc. W72-05615

AIR CONTAINING NITROGEN-15 AMMONIA: FOLIAR ABSORPTION BY CORN SEEDLINGS, Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05B. W72-05657

THE REPRODUCTIVE BIOLOGY OF THE SIL-VERJAW MINNOW ERICYMBA BUCCATA COPE IN KENTUCKY, Western Kentucky Univ., Bowling Green. Dept.

of Biology. Robert D. Hoyt.

Trans Am Fish Soc. 100 (3): 510-519. 1971. Illus. Identifiers: Age, Biology, Ericymba-Buccata, Kentucky, Minnow, Period, Reproductive, Silverjaw, Spawning.

The spawning period of the silverjaw minnow of Plum Creek in Shelby, Bullitt, and Spencer coun-Frum Creek in Sheiby, Buillt, and Spencer counties, Kentucky, extended from March through June, with the greatest spawning activity in April. Females of Age Group I had fewer primary ova with greater diameters than females of Age Groups II and III, which had successively more ova of smaller diameter. There was no correlation between diameter of ova and total length of female silverjaw minnows, but a high coefficient of correlation existed between number of ova and total length. The average number of mature ova was 748 and the average diameter was 0.75 mm. Spawning activity of fish in Pope Lick Creek, Jefferson County, Kentucky, in 1966, corresponded closely to that of fish in Plum Creek in 1968. Females of to that of this in Plum Creek in 1968. Females of Age Group II formed the most important breeding class in Plum Creek, while females of Age Group I were most important in Pope Lick Creek. Num-bers of males and females taken from Plum Creek were comparable.—Copyright 1971, Biological Abstracts, Inc. W72-05686

ON SOLVING THE NON-LINEAR DIFFUSION EQUATION FOR THE RADIAL FLOW OF WATER TO ROOTS, Commonwealth Scientific and Industrial Research

Organization, Canberra (Australia). Div. of Land

For primary bibliographic entry see Field 02G. W72-05707

FUNGAL GROWTH RESPONSES TO OSMOTIC AS COMPARED TO MATRIC WATER POTEN-TIAL,

Wisconsin Univ., Madison. A. A. Adebayo, and R. F. Harris.
Soil Sci Am Proc. 35 (3): 465-469. 1971. Illus. Identifiers: Alternaria-Tenuis, Fungal, Growth, Matric, Moisture, Osmotic, Phytophthora-Cin-namomi, Potential, Retention, Soil, Water.

The osmotic and matric water potential charac-teristics of Phytophthora cinnamomi and Alter-naria tenuis, fungi of widely different tolerance to water stress, were evaluated using agar media of varying nutritional status and 3 texturally different soils. The water potential of the agar media was controlled osmotically with KCl or sucrose. For the osmotic soil system, soil water content was maintained approximately constant and the desired water potential range was achieved by adding KCl solutions of different concentrations to air-dry soil samples at a level equivalent to the water content of the field moist soils; for the matric system, decreases in water potential were achieved by adding decreasing volumes of water to air-dry soil according to the moisture retention characteristics of the soils. Fungal growth was

#### Group 21-Water in Plants

determined by measuring changes in colony diameter with time. Osmotic water potentials for optimum fungal growth in agar and soil systems were similar to the water potentials for optimum growth in soils of matric-controlled water potential. However, with decreasing water potential both fungi were much less tolerant to matric than to osmotic stress, emphasizing that fungal response to decreasing soil water cannot be explained solely on a water potential basis, but must include consideration also of changes in other water-related soil properties such as solute transport. Fungal responses to matric and osmotic water potential differences were not related to soil texture. From a practical standpoint, the matric potentials at which growth extinction occurred were numerically 1/2-2/3 of the corresponding osmotic potentials at which growth ceased. If this relationship holds for other fungi and other soils, fused exactly responses to well-process fungal growth responses to water potential ob-tained using simple agar systems of osmotic-con-trolled water potential should provide useful ap-proximations of the matric water potential rela-tions of fungi in soil, thereby facilitating prediction of the maximum soil water potential range within which specific fungi may develop competitively in natural soils.—Copyright 1971, Biological Abstracts, Inc. W72-05717

OBSERVATIONS ON THE INGOLFIELLIDAE (AMPHIPOD CRUSTACEANS) OF GREECE, (IN

Centre Nationale de la Recherche Scientifique, Moulis (France). Laboratoire Souterrain.

Claude Bou. Biol Gallo-Hellen. 3 (1): 57-70. 1970. Illus. Maps.

English summary.
Identifiers: Amphipod, Crustaceans, Greece, Ingolfiella-Petkovskii, Ingolfiellidae, New record.

The interstitial Amphipoda Ingolfiella petkovskii, discovered on the subterranean sheets of fresh water near the sea at Keramou (Euboea) is a new record for Greece. A rich stocking of hypogeous Crustacea was revealed by prospecting the under-flow of different rivers in Etolia and Peloponnesus by pumping.--Copyright 1971, Biological Abstracts, Inc. W72-05728

EFFECT OF THE CONCENTRATION OF FODDER ORGANISMS ON THE INTENSITY OF THEIR USE BY FISH LARVAE, (IN RUSSIAN), Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.

O. I. Kudrinskava Gidrobiol Zh. 6 (5): 75-79. 1970. Illus.

Identifiers: Bosmina-Longirostris, Brachionus-Caliciflorus, Bream, Carp, Concentration, Cyclops-Vicinus, Fish, Fodder, Intensity, Keratella, Larvae, Organisms, Perch, Polyphemus-Pediculus, Roach.

Larvae of perch, bream, roach and carp were studied. The index of food use for given concentra-tions of zooplankton including Polyphemus pediculus, Bosmina longirostris, Cyclops vicinus, Keratella, Brachionus caliciflorus and others, was computed. With increases in the concentration of zooplankton, its use by the larvae increased to some extent. The relationship between the concentration of zooplankton and its use was not represented by a straight line. In larvae in the early stages of development satiation in 1 feeding oc-curred at high concentrations of zooplankton. With the computed indices the real index of food usage can be computed from the concentration of zooplankton.--Copyright 1971, Biological Abstracts, Inc. W72-05733

RESULTS OF COMPARATIVE STUDIES OF THE ACCUMULATION AND DECOMPOSITION OF THE BIOMASS OF PLANTS IN MOUNTAIN CHERNOZEMS, (IN RUSSIAN), A. K. Khtryan, and M. A. Vartanyan.

Izv S-Kh Nauk. 1. 47-54. 1968.

Identifiers: Accumulation, Biomass, Chernozems, Comparative, Decomposition, Grass-M, Herbs, Legume-D, Mixed, Moisture, Mountain, Plants, Soil, Wheat-M.

The accumulation of biomass increased from chernozems with low moisture content of those with high moisture content. Decomposition intensified in the same direction, in parallel with the increase in the hydrothermic factor. The plants formed the following series with respect to the decomposition rate of biomass (series): mixed herbs > legumes > natural grasses > winter wheat .-- Copyright 1971, Biological Abstracts, Inc. W72-05810

#### 2J. Erosion and Sedimentation

SYSTEM AND METHOD FOR PREVENTING EROSION, For primary bibliographic entry see Field 04D. W72-05316

CHANNEL PROCESSES DURING DIVERSION OF STREAMFLOW (RUSLOVYYE PROTSESSY PRI PEREBROSKE STOKA), For primary bibliographic entry see Field 08B. W72-05357

CHEMICAL RESOURCES OF SEAS EAS AND RESURSY (KHIMICHESKIYE OCEANS MOREY I OKEANOV).
Akademiya Nauk SSSR, Moscow. Okeanograficheskaya Komissiya. For primary bibliographic entry see Field 02K. W72-05499

CONNATE-WATER SOLUTIONS OF THE BAL-TIC SEA AND GULF OF RIGA (GRUNTOVYYE RASTVORY BALTIYSKOGO MORYA I RIZH-SKOGO ZALIVA), All-Union Research Inst. of Marine Fisheries and

Oceanography, Moscow (USSR). For primary bibliographic entry see Field 02K. W72-05500

COMPARATIVE GEOCHEMICAL DESCRIP-TION OF ORGANIC MATTER IN RECENT SEDIMENTS OF WESTERN AND EASTERN SLOPES OF THE SOUTHERN CASPIAN BASIN (SRAVNITEL'NAYA GEOKHIMICESKAYA WHABAKTERISTIKA GEONICHESKAYA KHARAKTERISTIKA ORGANICHESKOGO VESHCHESTVA SOVREMENNYKH OSADKOV ZAPADNOGO I VOSTOCHNOGO SKLONOV YUZHNO-KASPIYSKOY VPADINY), Azerbaidzhanskii Nauchno-Issledovatelsii Institut

po Dobyche Nefti, Baku (USSR). For primary bibliographic entry see Field 02K. W72-05507

COMPOSITION OF ORGANIC MATTER IN BOTTOM SEDIMENTS OF THE BLACK SEA (OSOBENNOSTI SOSTAVA OR-GANICHESKOGO VESHCHESTVA GLU-OSADKOV CHERNOGO BOKOVODNYKH MORYA), Moscow State Univ. (USSR).

V. N. Florovskaya, and Yu. N. Gurskiy. In: Khimicheskiye resursy morey i okeanov; 'Nauka', Moscow, p 226-236, 1970. 2 fig, 4 tab, 21

Descriptors: \*Sedimentation, \*Bottom sediments, \*Organic matter, \*Water chemistry, \*Chemical analysis, Bituminous materials, Asphalt, Oil, Carbon, Humus, Deep water, Cores. Identifiers: \*USSR, \*Black Sea, \*Hydrocarbons,

\*Bitumen, Sapropel, A Perylene, Luminescence. Sapropel, Asphaltite, Asphaltenes,

Composition and distribution of organic matter were determined in 25 cores of bottom sediments

collected from the central and northern parts of the Black Sea in 1963-64. Maximum content of or-ganic matter was confined to sapropel interlayers of the ancient marine sediments. Content of b mens, humic substances, and organic carbon in the sediments was 6.5%, 11%, and 22.5%, respective-Jy. The presence of high-molecular, long-chain ox-ygen compounds of the acids group and of highly condensed aromatic hydrocarbons (perylene and 1.12-benzperylene) was established. Microscopic studies revealed carbonaceous substances resembling kerite, asphaltite, and petroleum in cracks crosscutting the kerite and asphaltite. Abiogenic carbonaceous substances, epigenetic in relation to their enclosing sediments, may be formed along with bituminous substances of syngenetic sediments composed of biogenic organic matter. (See also W72-05499) (Josefson-USGS)

VERTICAL DISTRIBUTION OF PHOTOSYNTHETIC PIGMENTS AND THE PENETRATION OF LIGHT IN MARINE SEDI-Copenhagen Univ., Helsingoer (Denmark). Marine

Biological Lab. For primary bibliographic entry see Field 05A. W72-05619

REPRESENTATION OF BED CONFIGURA-TIONS IN DEPTH-VELOCITY-SIZE DIA-GRAMS,

Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences. J. B. Southard.

Journal of Sedimentary Petrology, Vol 41, No 4, p 903-915, December 1971. 5 fig, 2 tab, 42 ref. ONR Contract Nonr 1841 (74).

Descriptors: \*Sediment transport, \*Channel morphology, \*Sedimentary structures, Dunes, Ripple marks, Particle size, Velocity, Density, Open channel flow, Alluvial channels, Turbulent flow, Sedimentation.

Depth and mean velocity can be used to characterize bed configurations in uniform open-channel flow over a loose sediment bed. A three-dimensional diagram, with dimensionless measures of depth, mean velocity, and sediment size (or these three variables themselves) as coordinates, have the property of one-to-one correspondence between possible bed configurations and points in the diagram, thus eliminating overlapping of fields in diagrams involving bed shear stress. The diagram is most readily visualized by means of depthrelocity sections for a series of sediment sizes. Depth-velocity diagrams plotted for five sediment sizes ranging from fine sand to very coarse sand show contiguous but nonoverlapping fields for ripples, dunes, transition, and flat bed (in the finer sands) and lower flat bed, dunes, transition, and upper flat bed (in coarser sands), with increasing mean velocity; field boundaries are almost parallel mean velocity; neid boundaries are aimost parallel to the depth axis or slightly inclined. Each of these fields is truncated by a field for standing waves and antidunes at smaller depth or higher velocity. The dune field, which lies between the fields for ripples and flat bed in the fine to medium sand range wedges out with decreasing sediment size at about 0.08 mm; in finer sediments, ripples pass directly into a flat bed. If the densities of fluid and sediment are varied, then there is a different depth-velocity-size diagram for each ratio of sedi-ment density to fluid density. (Knapp-USGS) W72-05622

LABORATORY STUDY OF TRANSPORT OF FINE SAND,

Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

J. C. Willis, N. L. Coleman, and W. M. Ellis.

Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY3, Paper 8765, p 489-501, March 1972, 4 fig, 1 tab, 10 ref, append.

## Erosion and Sedimentation—Group 2J

Descriptors: \*Sediment transport, \*Hydraulic models, Particle size, Channel morphology, Sedi-mentary structures, Sedimentation, Sands, mentary structures, Sedimental Hydraulic similitude, Sediment load

The relationships between the transport of fine sand and the flow variables were studied in laborasand and the flow variables were studied in labora-tory tests. Data were collected in 105 experiments with sand bed material having a median sieve diameter of 0.1mm in a 100-ft (30.48m)-long by 4-ft (1.22m)-wide recirculating flume. The concentra-tion of the transported material depends in a rather complex, but consistent way on the basic flow variables. A graphical relationship between the concentration and the flow discharge per unit of channel width defines consistent curves of equal channel with defines consistent curves of equal depth and readily delineates the various bed form regimes. A similitude analysis of published transport data for coarser sands suggests a single curve for concentration versus Froude number for each median sediment size. Separate curves of concentration versus Froude number were calculated for trauon versus rroude number were calculated for the different bed form regimes. At depths less than or equal to 0.7 ft (0.21m) there is a continuous rela-tionship like that for coarser sands; at deeper depths an extended plane bed curve segment was found. (Knapp-USGS) W72-05626

PORE FLUIDS OF RECENT MARINE SEDI-MENTS: II. ANOXIC SEDIMENTS OF 35 DEG TO 45 DEG N, GIBRALTAR TO MID-ATLA-

NTIC RIDGE,
University of Southern California, Los Angeles.
Dept. of Geology.
For primary bibliographic entry see Field 02K.
W72-05627

FEATURES OF COARSE-GRAINED, HIGH-CO-NCENTRATION FLUIDS AND DEPOSITS.

California Univ., Santa Barbara.

Journal of Sedimentary Petrology, Vol 41, No 4, p 916-927, December 1971. 10 fig, 46 ref.

Descriptors: \*Sediment transport, \*Rheology, \*Landslides, \*Mudflows, Movement, Mass wasting, Mud, Particle size, Density, Viscosity, Plasticity, Non-Newtonian flow.

Field, laboratory, and theoretical investigations were made of fluids with very high concentrations of solid particles in water (up to 90%). They exhibit the property of strength, have high apparent viscosities which vary with velocity, have high bulk densities, and flow in laminar fashion or with greatly reduced turbulence. Debris flows deposit debris which is poorly sorted, has an unsupported framework, may contain elongate fragments which are roughly aligned parallel to bedding, and may show inverse grading. On low slopes, debris flow deposits commonly overlie easily eroded materials with little or no features of erosion. Subaqueous deposits in the geologic record which show these or somewhat similar features were probably emplaced as highly concentrated disper-sions. (Knapp-USGS) W72-05628

SUBAERIAL LEACHING IN THE LIMESTONES OF THE BOWAN PARK GROUP (ORDOVI-CIAN) OF CENTRAL WESTERN NEW SOUTH

WALES, Sydney Univ. (Australia). Dept. of Geology and Geophysics. V. Semeniuk

Journal of Sedimentary Petrology, Vol 41, No 4, p 939-950, December 1971. 9 fig, 30 ref.

Descriptors: \*Diagenesis, \*Limestones, \*Leaching, Sedimentation, Mineralogy, Calcium carbonate, Carbonates, Carbonate rocks, Erosion.

Diagenetic leaching in the limestones of the Bowan Park Group (Ordovician) of Australia selectively dissolved fossils, producing various types of fossil molds and possibly some cavities. The solution of limestone and the subsequent filling of cavities with sparry calcite, diagnetic silt, pellets, sand-sized grains, and marine sediment altered the original fabric to one of the following. (1) fossil cayis in limestone. (2) interconlowing: (1) fossil casts in limestone, (2) interconnecting spar-filled vugs in limestone, (3) mottled limestone, or 4 () Stromatactis limestone. In general, the most common occurrence of solution effects is just beneath erosional surfaces, and is inferred to result from subaerial exposure. (Knapp-USGS) W72-05629

CHEMICAL WEATHERING IN A SUBTROPI-CAL IGNEOUS TERRAIN, RIO AMECA, MEX-ICO,

s Institution of Oceanography, La Jolla, Calif. Geological Research Div. For primary bibliographic entry see Field 02K. W72-05630

SIZE MODES IN BIOGENIC CARBONATE

SIZE MODES IN BIOGENIC CARBONATE SEDIMENT, SOUTHEASTERN ALASKA, Alaska Univ., College. Inst. of Marine Science; and Alaska Univ., College. Dept. of Geology. C. M. Hoskin, and R. V. Nelson, Jr. Journal of Sedimentary Petrology, Vol 41, No 4, p 1026-1037, December 1971. 8 fig, 1 tab. 27 ref. ACS, Petroleum Res Fund Grant PRF 4379-AC2.

Descriptors: \*Sedimentation, \*Particle size, \*Erosion, \*Carbonate rocks, \*Alaska, Scour, Sediments, Sands, Beaches, Gravels. Identifiers: Carbonate sands.

Living communities of intertidal encrusting barnacles and submarine infaunal pelecypods supply skeletons to presently accumulating carbonate sediment in Sitka Sound, Alaska. Fragmentation of these barnacles and mollusks produces a con tinuous spectrum of particles between 12 and 0.1 mm. Size modes are weak and diffuse in the zone of grinding, but size modes are sharp and well developed in accumulated carbonate sediment of inner bays and beaches. Matching size-frequency distributions for biogenic carbonate and detrital silicate fractions of the same sample suggest size modes are the result of selective sorting during transport and do not reflect the size-frequency distribution of the source. Beach and inner bay car-bonate accumulations are sandy gravels to gravelly sands and contain an average of 66 wt. percent CaCO3. Average mineralogy of the car-bonate is 15-30 wt. percent aragonite and 85-70 percent calcite with calcites containing less than 1 mol. % Mg. Average constituent grain composition for 24 samples from Pirate Cove is barnacles 74, mollusks 12, echinoids 10, forams 2, and bryozoans 2 percent by volume. (Knapp-USGS) W72-05631

SHORT DISTANCE FLUVIAL ROUNDING OF

VOLCANIC DETRITUS, Georgia Univ., Athens. Dept. of Geology. T. H. Pearce. Journal of Sedimentary Petrology, Vol 41, No 4, p 1069-1072, December 1971. 1 fig, 14 ref.

Descriptors: \*Particle shape, \*Alluvium, \*Erosion, \*Alluvial channels, \*Sediment transport, Topography, Stratigraphy, Sedimentation, Sedi-

A distinctive rock type occurs locally as large subrounded to rounded clasts in conglomerates of the Crowsnest Formation, Alberta, Canada. To help identify its source, mountainous terrain was used as a model of the Early Cretaceous volcanic terrain. Recent detritus in a stream which cuts the volcanics becomes rounded in less than two miles of travel. Abrasion of the larger clasts by the smaller detritus while the larger clasts are imbedded in the stream bed is an important cause of the short distance rounding. (Knapp-USGS) W72-05632

THUNDER BAY: AN EXAMPLE OF A SILLED FRESH-WATER BAY, Lakehead Univ., Port Arthur (Ontario). For primary bibliographic entry see Field 02H.

INTERNAL STRUCTURES IN EOLIANITES AND PALEOWINDS, MEDITERRANEAN COAST, ISRAEL, Hebrew Univ., Jerusalem (Israel). Dept. of Geolo-

gy.
D. H. Yaalon, and J. Laronne.
Journal of Sedimentary Petrology, Vol 41, No 4, p
1059-1064, December 1971. 8 fig, 2 tab, 15 ref.

Descriptors: \*Dunes, \*Stratigraphy, \*Paleoclimatology, \*Winds, Coasts, Sedimentary structures, Sediment transport, Deposition (Sediments). Identifiers: Israel.

At seven sites on the coastal sands of Israel, about half of the crossbedded eolianite body is com-posed of steep avalanche bedded slipface laminae. posed of steep avananche ocuded suprace ammnae.

About 10% are windward facing sets and the rest gentle leeward facing sets. The overall model direction is in good agreement with the present, prevalently westerly and southwesterly wind regime. Shear stress differences seem responsible for the northelestic settle set for the particle size sorting and lamination both on the rippled and slipface surfaces of the dunes. The proportion of steep avalanche bedded cosets seems to be a characteristic of the type of dune, decreasing in the order barchans, transverse ridges, seifs. (Knapp-USGS) W72-05634

EXPERIMENTS ON LONGSHORE TRANSPORT AND SORTING OF PEBBLES: CHESIL BEACH, ENGLAND,

Nature Conservancy, Wareham (England).

A. P. Carr. Journal of Sedimentary Petrology, Vol 41, No 4, p 1084-1104, December 1971. 10 fig, 7 tab, 34 ref.

Descriptors: \*Sediment transport, \*Beaches, Tracers, Tracking techniques, Sands, Waves (Water), Surf, Ocean waves, Currents (Water), Gravels, Particle size.

Identifiers: \*Longshore drift, Chesil Beach (England), Particle sorting.

Longshore transport experiments were undertaken in 1969 and 1970 using natural beach material introduced onto Chesil Beach, England. Rates of movement for the quartz granulites at Wyke reaches 343m per day but after 165 days the farthest travelled was only 3952m from its origin. This reflects both the proportion of time that This reflects both the proportion of time that material is out of circulation by being above or below the zone of wave action and transport opposite to the prevailing direction from time to time. Lateral movement of individual pebbles is not necessarily greater under storm conditions. There is a relationship between pebble size and longshore movement. Shape sorting and shape longshore invertient. Snape sorting and snape abrasion do not appear to play an important part on this beach. Longshore sorting is most likely achieved by a vector imparted by the direction of wave approach. (Knapp-USGS)

ORIGIN OF SHELL BEACHES, PADRE ISLAND, TEXAS,

Marine Science Inst., Port Aransas, Tex. R. L. Watson.

Journal of Sedimentary Petrology, Vol 41, No 4, p. 1105-1111, December 1971. 6 fig, 13 ref.

Descriptors: \*Littoral drift, \*Texas, \*Beaches, \*Sedimentation, Currents (Water), Ocean currents, Dunes, Provenance, Gulf of Mexico, Carbonates, Distribution patterns. Identifiers: \*Padre Island (Tex).

Central Padre Island, Texas is the site of a convergence of littoral drift which causes shell and sand

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from the entire coast to accumulate in the convergence area. Shell material is then concentrated on the beach by aeolian deflation of finer grained terrigenous sand which blows inland to contribute to the extensive infilling Laguna Madre by wind-tidal flats, and perhaps ultimately to contribute to the aeolian sand plain of the mainland. Ancient shell beaches of the Pleistocene bear great similarity to the modern shell beaches of Padre Island, suggesting that the general coastal configuration and wind patterns were similar to modern patterns at the time of their formation. Large carbonate accumulations can occur solely as the result of a sorting process in an area of great terrigenous sediment supply. (Knapp-USGS) W72-05636

SEDIMENT SOURCES AND DISPERSAL PAT-TERNS OF OREGON CONTINENTAL SHELF SANDS.

Oregon State Univ., Corvallis. Dept. of Oceanog-

K. F. Scheidegger, L. D. Kulm, and E. J. Runge. Journal of Sedimentary Petrology, Vol 41, No 4, p 1112-1120, December 1971, 4 fig, 2 tab, 26 ref. NR 083-102, ONR Contract N000 14-67-A-0369-0007 USGS Contracts 14-08-0001-10766,-111941, and -

Descriptors: \*Sands, \*Continental shelf, \*Oregon, patterns, \*Paleoclimatology, \*Distribution Prevenance, Sediment transport, Littoral dirft, Pleistocene epoch, Sedimentation, Currents (Water), Ocean currents. Identifiers: Paleocurrent analysis.

Heavy minerals of the rivers of Oregon and northern California outline four major sources of sediments on the Oregon continental shelf. These sources include the Columbia River Basin, the Oregon Coast Range, the Klamath-Sishiyou Mountains, and terrace deposits along the central Oregon coast. Dispersal patterns of sand-size sediments show that the dominant direction of littoral transport has been to the north at least during the past 18,000 years. Sands were transported 170 miles to the north on the continental shelf during the end of the Lake Wisconsin regression and the beginning of the Early Holocene transgression. The observed dispersal patterns of heavy minerals may be indicative of more efficient littoral processes during the last major sea level lowering. Reduction of sand supply to the littoral zone and natural obstacles, such as erosionally resistant headlands, to the littoral transport of sand have apparently limited the northward transport of sand during the past 3,000 years. (Knapp-USGS) W72-05637

SUSPENDED SEDIMENT INCREASE DUE TO HURRICANE GERDA IN CONTINENTAL SHELF WATERS OFF CAPE LOOKOUT, NORTH CAROLINA,

Illinois Univ., Chicago. K. S. Rodolfo, B. A. Buss, and O. H. Pilkey. Journal of Sedimentary Petrology, Vol 41, No 4, p 1121-1125, December 1971. 3 fig, 1 tab, 3 ref. NSF Grants GA-1072 and GA-12783.

Descriptors: \*North Carolina, \*Sediment transport, \*Hurricanes, \*Surf, \*Continental shelf, Beaches, Suspended load, Sampling. Identifiers: Hurricane Gerda (1969), Cape Lookout (NC).

Suspended sediment concentrations and average grain sizes in surface and near-bottom inshore waters off Cape Lookout, North Carolina increased significantly following the passage of Hurricane Gerda in September, 1969. This effect was dissipated within a week after the hurricane. Transport of inner shelf sediment to the outer Carolina shelf may be accomplished mainly by such storms. (Knapp-USGS) W72-05638

RELATIONSHIPS BETWEEN BOTTOM TOPOGRAPHY AND MARINE SEDIMENT PROPERTIES IN AN AREA OF SUBMARINE GULLIES.

Lockheed Missiles and Space Co., San Diego, Calif. Lockheed Ocean Lab.

Call Lockness Ocean Lab.

A. L. Inderbitzen, and F. Simpson.

Journal of Sedimentary Petrology, Vol 41, No 4, p
1126-1133, December 1971. 5 fig, 2 tab, 15 ref.

Descriptors: \*Bottom sediments, \*Topography, \*California, Sampling, Bathymetry, Sedimentation, Distribution patterns, Oceanography, Gul-

Identifiers: Submarine gullies.

A precise bathymetric survey, including the collection of 21 cores, was made along a gullied section of the upper San Diego Trough slope off Del Mar, California to investigate the relationship between topography and the mass physical proper-ties of marine sediments. Submarine gullies begin at the edge of the shelf and trend almost directly westward. The lateral extent of these gullies is from 800 to 1200 meters. Width of the larger gullies varies from 203 to 274 meters. The gullies have a relief of 18 to 30 meters. The morphology of the gullies strongly suggests that they were originally formed by subaerial erosion. Within the submarine gullies the only sediment property which appears possibly to be related to the topography is the grain size distribution. Water content values decrease as the size of the sediment particles increases. (Knapp-USGS) W72-05639

DESERT GLAZE,

SIYANCO, Riyadh (Saudi Arabia). E. P. Fisk. Journal of Sedimentary Petrology, Vol 41, No 4, p 1136-1137, December 1971.

Descriptors: \*Deserts, \*Weathering, \*Dew, Arid climates, Microclimatology. \*Silica. Identifiers: Desert glaze.

In the middle of the great Sahara of North Africa, the upper surfaces of a few dense, siliceous peb-bles exhibited a thin, colorless, transparent, highly lustrous coating, which is named desert glaze. In petrographic thin sections the glaze ranges up to 0.01 mm in thickness. Desert glaze is derived from its host rock by the action of dew repeatedly dissolving minute quantities of silica and depositing them upon evaporation. (Knapp-USGS) W72-05640

A PEBBLE MEASURER FOR LABORATORY USE, GIVING A PUNCHED TAPE OUTPUT, The Nature Conservancy, Wareham (England). Furzebrook Research Station.

P. J. Hardcastle. Journal of Sedimentary Petrology, Vol 41, No 4, p 1138-1139, December 1971. 3 fig.

Descriptors: \*Instrumentation, \*Particle size, \*Measurement, Sediments, Data collections. Identifiers: Pebble measurer.

Large numbers of pebbles in the size range 1mm to 100mm can be rapidly and accurately measured with the device described. The measurements are shown on a four figure numerical display, and are also punched on paper tape. The pebbles are measured instrumentally to an accuracy of better than plus or minus 0.5%. (Knapp-USGS) W72-05641

SEDIMENT DISCHARGE COMPUTATION PROCEDURES, Department of the Environment, Ottawa (On-

tario). Inland Waters Branch.

N. Tywoniuk. Journal of the Hydraulics Division, Society of Civil Engineers, Vol 98, No HY3, Paper 8783, p 521-540, March 1972. 5 fig, 1 tab, 19 ref, Descriptors: \*Sediment transport, \*Bed load, \*Sedimentation, \*Reviews, Alluvial channels, Hydraulics, Mathematical models, Sediment discharge.

Some recent and accepted sediment transport concepts are reviewed as they apply to transport rates cepts are reviewed as they apply to transport rates in flow systems. The analysis covers bed, suspended, and total discharge computation procedures with descriptions of mathematical modeling techniques where applicable. The merits and the limitations of the various procedures are described. Finally, recommendations are made with respect to the use and application of the analysis for sediment transport prediction. (Mannalis of the procedure of t sis for sediment transport prediction. (Knapp-W72-05642

EDGE WAVES AND CRESCENTIC BARS. Institute of Coastal Oceanography and Tides, Birkenhead (England).

A. J. Bowen, and D. L. Inman. Journal of Geophysical Research, Vol 76, No 36, p 8662-8671, December 20, 1971. 5 fig, 2 tab, 13 ref.

Descriptors: \*Ocean waves, \*Coasts, \*Beaches, \*Sands, \*Sediment distribution, Shores, Sand bars, Sand spits, Currents (Water), Model studies, On-site investigations, Littoral drift, Sediment Identifiers: \*Edge waves, Crecentic bars.

The velocity fields associated with edge waves on a sloping beach were examined as possible causes of sedimentary features of a regular, rhythmic pattern in the longshore direction. Standing edge waves provide a satisfactory explanation for the formation of crescentic bars in regions of small tidal range, the bars having longshore wavelength of one-half that of the edge waves. In the absence of large surface waves, the edge waves may also form cuspate features on the beach face, with the points of the cusps directly opposite to the borns. a sloping beach were examined as possible causes points of the cusps directly opposite to the horns of the crescentic bars. Standing edge waves with periods of 30-60 secs and significant amplitudes occur extensively on real beaches. (Woodard-USGS) W72-05649

EFFECT OF CORN STEEP LIQUOR FOR ERO-SION CONTROL ESTABLISHMENT AND VEGETATIVE BACKSLOPES, Ohio Agricultural Research and Development Center, Wooster. For primary bibliographic entry see Field 04D.

W72-05698

EARLY DIAGENESIS OF CLAY MINERALS, RIO AMECA BASIN, MEXICO, Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div. For primary bibliographic entry see Field 02L. W72-05850

INSTRUMENT FOR MEASURING SURFACE INSTRUMENT FOR MEASURING SURFACE
VELOCITY OF WATER-ROCK MUDFLOWS (O
PRIBORE DLYA IZMERENIYA POVERKHNOSTNOY SKOROSTI VODOKAMENNYKH
SELEVYKH POTOKOV),
Moscow State Univ. (USSR). Problemnaya
Laboratoriya Snezhnykh Lavin i Selei.

For primary bibliographic entry see Field 07B. W72-05858

DELTAIC SEDIMENTATION IN GLACIAL LAKE DOUGLAS,

Illinois State Geological Survey, Urbana. G. S. Fraser, and J. C. Steinmetz. Illinois Geological Survey Circular 466, 1971. 12 p, 5 fig, 1 tab, 19 ref.

Descriptors: \*Sedimentation, \*Lakes, \*Glacia-Glacial drift, Surveys, Sedimentology.

Identifiers: \*Glacial lakes, \*Lake Douglas (III).

A lobate sand body extends into the basin of gla-cial Lake Douglas from a gap in both the Pesotum and West Ridge Moraines in east-central Illinois. Textural analyses show that the sand body is com-posed of four distinct sands that are distinguished on the basis of their sand:silt:clay ratios, mean grain size, and sorting. Underlying the sands are fine-grained sediments that are classified into nne-grained sediments that are classified into three units-sandy silt, clayey silt, and silty clay. The sands probably were deposited as a delta built into Lake Douglas. The lower sediments represent an initial period of fluvial deposition, and the overlying sands represent successive periods of deltaic represents interpreted by merchanical control of the proposition in the proposition of the propos progradation interrupted by periods of nondeposi-tion of erosion. (Woodard-USGS)

#### 2K. Chemical Processes

QUANTITY-INTENSITY RELATIONSHIPS FOR LABILE SODIUM IN FIELD SOILS. Rothamsted Experimental Station, Harpenden (England). For primary bibliographic entry see Field 02G. W72-05329

FORMATION WATERS, HOT SPRINGS AND MINERALIZATION PHENOMENA ALONG THE EASTERN SHORE OF THE GULF OF SUEZ.

Geological Survey of Israel (Jerusalem). A. Issar, E. Rosenthal, Y. Eckstein, and R. Bogoch.

Bulletin, Vol. 16, No. 3, p 25-44 September 1971. 9 fig, 4 tab, 32 ref.

Descriptors: \*Water chemistry, \*Hot springs, \*Mineral water, Thermal water, Mineralogy, Diagenesis, Brines, Oil fields, Connate water. Identifiers: Red Sea.

The chemical composition of formation waters tapped in oil wells and emerging as hot springs along the Suez coast of Sinai was examined. An explanation is proposed for the geochemical evolution of these waters and their relation to the geological history of the area. The thermal regime in the investigated area is characterized by highin the investigated area is characterized by ngg-gradient foci in the immediate proximity of major faults. Iron mineralization, dolomitization, and concentration of heavy metals were observed on the eastern shore of the Gulf of Suez. The formation waters have ionic ratios similar to those of the hot brines found in the three Deeps of the Red Sea. Thermal and mineralization phenomena also show a resemblance to those of the Deeps. (Knapp-W72-05333

GEOCHEMISTRY OF AQUEOUS DISPERSION HALOS OF MERCURY DEPOSITS AND MERCURY MIGRATION MODES IN GROUND WATER (GEOKHIMIYA VODNYKH OREOLOV RASSEYANIYA MESTOROZHDENIY RTUTU I FORMY YEYE MIGRATSII V PODZEMNYKH VODAKH),

Scientific Research Hydrogeology and Engineering Geology, Moscow (USSR). For primary bibliographic entry see Field 05B. W72-05351

PRINCIPAL TYPES OF LAKES IN KARST REGIONS (OSNOVNYYE TIPY OZER KARSTOVYKH RAYONOV), For primary bibliographic entry see Field 02H. W72-05352

PRINCIPLES OF HYDROCHEMISTRY (OS-NOVY GIDROKHIMID). Institut, Novocherkassk (USSR). ry bibliographic entry see Field 05G. For primar; W72-05354

SPECTROGRAPHIC DETERMINATION OF TRACE\_ELEMENTS (HEAVY METALS) IN NATURAL WATERS (SPEK-TROGRAFICHESKOYE OPREDELENIYE MIKROELEMENTOV (TYAZHELYKH METAL-MIKROELEMENTOV (11 AZAKA), LOV) V PRIRODYNKH VODAKH), Cidaskimicheskii Institut, Novocherkassk

For primary bibliographic entry see Field 05A. W72-05356

CAVES (PESCHERY).

Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.

Peshchery, No 7 (8), Perm, Mikhaylov, G. K., editor, 1969. 132 p.

Descriptors: "Caves, "Mineralogy, "Geochemistry, "Petrography, "Hydrogeology, Water chemistry, Groundwater, Saline lakes, Salts, Brines, Clays, Carbonate rocks, Limestones, Calcite, Gypsum, Karst, Sinks, Crystals, Ice, Reviews. Identifiers: "USSR, "Yugoslavia, "Speleology, "Speleothems, Stalactites, Stalagmites, Dripstone, Flowstone, Grottoes."

This monograph examines the mineralogy, litholo-This monograph examines the mineralogy, lithology, and geochemistry of caves; the formation of karst sinks, wells, arches, and bridges; and the activities of speleological organizations in the USSR and Yugoslavia. Specific topics covered in the book include: (1) stratigraphic distribution of gypsum karst caves of the USSR, United States, and Western Europe; (2) formation of ice crystals in the Kungur cave (Perm Oblast); (3) formation of ice columns, speleothems, and calcite dams, pockets, and chambers in caves of the Bashkir ASSR; (4) chemistry of underground saline lakes in the Perm Oblast; (5) classification of Crimean underground karstic lakes; (6) geochemistry of clays of the Div'ya cave (Perm Oblast); (7) discovery of diatomaceous earth in Central Siberian caves; (8) age of flowstone formations in a West Podolian cave; (9) evolution of horizontal karst caves in carbonate deposits; (10) classifica-tion of Hungarian caves; (11) compaction and den-sity of karst caves of the Ural Area and of caves in karst regions of the Northwestern Altay: (12) depth of Ural sinks and wells; (13) discovery of depth of Oral sinks and weals, (13) accovery of the karst arches in the Chusovaya River valley (Perm Oblast); (14) geographic distribution of sinks and grottoes of the USSR; and (15) utilization of karstic waters of Yugoslavia as a water-power source. The text is concluded with several book reviews and news items on recent developments in the fields of karst science and speleology. (Josefson-USGS) W72-05359

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 5 AND 6. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS, AND MISSOURI RIVER BASIN. Geological Survey, Washington, D. For primary bibliographic entry see Field 07C. W72-05415

MERCURY-VAPOR DETECTOR, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla. For primary bibliographic entry see Field 05A. W72-05427

GEL FILTRATION OF SURFACTANTS, Shionogi Research Lab., Osaka (Japan). For primary bibliographic entry see Field 05A. W72-05435

DETERMINATION OF CARBON-12, CARBON--13 ISOTOPIC ABUNDANCES AND NITROGEN/CARBON RATIOS IN BIOLOGI-CAL SUBSTANCES BY PROTON-REACTION ANALYSIS,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05A.

W72-05436

RADIOCHEMICAL DETERMINATION OF PLU-TONIUM IN ENVIRONMENTAL AND BIOLOG-ICAL SAMPLES BY ION EXCHANGE, Western Environmental Research Lab., Las For primary bibliographic entry see Field 05A.

ELECTRON-DONOR-ACCEPTOR COMPLEX-ING REAGENTS FOR THE ANALYSIS OF PESTICIDES. I. SURVEY OF REAGENTS AND INSTRUMENTAL TECHNIQUES, National Research Council of Canada, Halifax (Nova Scotia). Atlantic Regional Lab. For primary bibliographic entry see Field 05A. W72-05440

A COMPUTER-PROCESSED HIGH-PRECISION COMPLEXIMETRIC TITRATION FOR THE DETERMINATION OF THE TOTAL ALKALINE EARTH METAL CONCENTRATION IN SEA

Goteborg Univ. (Sweden). Dept. of Analytical Chemistry.

For primary bibliographic entry see Field 05A. W72-05441

'COLD VAPOR' METHOD FOR DETERMINING MERCURY.

National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab. For primary bibliographic entry see Field 05A. W72-05490

NEW, SIMPLIFIED METHODS FOR METAL ANALYSIS.

Environmental Protection Agency, Cincinnati, Ohio. Div. of Water Hygiene. For primary bibliographic entry see Field 05A. W72-05493

CHEMICAL RESOURCES OF SEAS OCEANS (KHIMICHESKIYE RESU OCEANS (ARIA-), MOREY I OKEANOV), Nauk SSSR, DESTIDSY Akademiya Nauk SSSR anograficheskaya Komissiya. Oke-Moscow.

'Nauka', Moscow, Bruyevich, S. V., editor, 1970.

Descriptors: \*Water chemistry, \*Chemical analysis, \*Water analysis, \*Oceans, \*Sea water, Mineralogy, Geochemistry, Chemical properties, Mineratogy, Coechemistry, Chemical properties, Inorganic compounds, Organic compounds, Or-ganic matter, Sediments, Salinity, Ice, Gases, Photosynthesis, Eutrophication, Water pollution, Analytical techniques, Instrumentation. Identifiers: "USSR, Mediterranean Sea, Black Sea, Baltic Sea, Sea of Azov, Red Sea, Biogenous substances, Hydrocarbons, Bitumen, Mineraliza-

This collection of 32 papers contains information on the chemistry of ice, sea water, and marine sediments in various parts of the world, including the Arctic, Atlantic, and Indian Oceans; Mediter-ranean, Red, Black, and Baltic Seas; and the Sea of Azov. The hydrochemistry of oceans and seas is examined against a background of new instru-mentation and promising methods of chemical analysis of mineral compounds and organic matter in sea water. A number of geochemical papers are devoted to examination of the liquid and organic aspects of sedimentation. The wide range of subject material presented is designed for oceanog-raphers, geochemists, hydrochemists, geologists, geographers, and workers in the field of fish management. (See also W72-05500 thru W72-05508) (Josefson-USGS)

#### **Group 2K—Chemical Processes**

CONNATE WATER SOLUTIONS OF THE BAL-TIC SEA AND GULF OF RIGA (GRUNTOVYYE RASTVORY BALTIYSKOGO MORYA I RIZH-SKOGO ZALIVA), All-Union Research Inst. of Marine Fisheries and

Oceanography, Moscow (USSR).

In: Khimicheskiye resursy morey i okeanov; 'Nauka', Moscow, p 67-78, 1970. 2 fig, 6 tab, 17

Descriptors: \*Water chemistry, \*Water analysis, \*Chemical analysis, \*Connate water, \*Aqueous solutions, Bottom sediments, Particle size, Organic matter, Iron, Manganese, Phosphates, Reduction (Chemical), Oxidation, Oxygen, Al-kalinity, Hydrogen ion concentration. Identifiers: \*USSR, Baltic Sea, Gulf of Riga, Biogenous substances, Benthonic water.

A chemical analysis was made of 55 samples o connate-water solutions from 32 stations in the Baltic Sea and of 27 samples from 16 stations in the Gulf of Riga to determine the relationship between accumulation of biogenous substances in connate-water solutions, and particle size and organic matter of sediments. Content of biogenous substances in the solutions is directly dependent on organic matter content and increases with sediment depth. Chemical composition of the solutions varies in accordance with the qualitative composition of organic matter. Connate-water solutions generally contain higher concentrations of man-ganese during reduction in water and soil. Iron is accumulated in the solutions in small concentra-tions. (See also W72-05499) (Josefson-USGS) W72-05500

CALCULATION OF FREE CO2 AND IN-DIVIDUAL FORMS OF SULFUR COMPOUNDS WATERS OF THE BLACK SEA (RASCHET SODERZHANIYA SVOBODNOY UGLEKIS-LOTY I OTDEL'NYKH FORM SERNISTYKH SOYEDINENIY V VODE CHERNOGO MORYA), Akademiya Nauk URSR, Sevastopol. Marine Hydrophysics Inst.

A. Skopintsev, and M. P. Maksimova.

In: Khimicheskiye resursy morey i okeanov; 'Nauka', Moscow, p 95-108, 1970. 3 fig, 11 tab, 19 ref.

Descriptors: \*Water chemistry, \*Water analysis, \*Chemical analysis, \*Carbon dioxide, \*Sulfur compounds, Hydrogen sulfide, Alkalinity, Salinity, Chlorine, Ions, Hydrogen ion concentration, Atmospheric pressure, Water temperature, Sea water, Deep water, Depth, Thermodynamics, Thermocline, Equations.
Identifiers: \*USSR, \*Black Sea, Borates,

Benthonic water.

Free CO2 and partial pressure of CO2 in Black Sea waters were calculated on the basis of data collected during the ninth voyage of the scientific research vessel Mikhail Lomonosov in October 1960. Partial pressure of CO2 increased with depth from 0.0003 atm at the surface to 0.00258 atm in deep waters of the halistatic region of the eastern half of the sea. Apparent CO2 dissociation constants required for computation were recalculated in relation to salt content and temperature of the sea water. Sulfide alkalinity increased with depth both absolutely and in relation to total alkalinity. At great depths, sulfide alkalinity was more than 10 times borate alkalinity, which was about 0.00002 N in the hydrogen sulfide zone. When H2S content was greater than 1 mg/liter, sulfides averaged 86%-90% of the total sulfur, the remainder representing free H2S. At depths below 1,000 m, the ratio of free H2S to free CO2 was about 0.5. (See also W72-05499) (Josefson-USGS) W72-05501

OXYGEN REGIME OF THE SEA OF AZOV AND OXYGEN FORMATION CONDITIONS
DURING REGULATED FLOW OF THE DON
RIVER (KISLORODNYY REZHIM AZOV- SKOGO MORYA I USLOVIYA YEGO FOR-MIROVANIYA V PERIOD ZAREGULIROVAN-NOGO STOKA R. DON), Azovskii Nauchno-Issledovatelskii Institut Ryb-

nogo Khozyaistva, Rostov-na-Donu (USSR). G. D. Makarova.

In: Khimicheskiye resursy morey i okeanov; 'Nauka', Moscow, p 109-114, 1970. 3 fig, 1 tab, 18

Descriptors: \*Water chemistry, \*Water analysis, \*Oxygen, \*River regulation, \*River flow, Mixing, Water level fluctuations, Water temperature, Photosynthesis, Organic matter, Nitrogen, Phosphorus, Eutrophication, Nutrients, Oxygen sag, Saturation, Cyanophyta, Phytoplankton, Surface waters. Seasonal.

Identifiers: \*USSR, Sea of Azov, Don River, Gulf of Taganrog, Biogenous substances, Benthonic

Regulation of the Don River in 1953 in connection with construction of the Tsimlyansk Reservoi (Rostov Oblast) has resulted in reduced seasonal fluctuations in water levels of the river, which, in turn, has stabilized the uptake of biogenous substances by the Sea of Azov. Saturation and distribution of oxygen in the sea waters have undergone considerable seasonal variations. Oxygen content is determined in winter by water tempera-ture and photosynthesis, in spring by phytoplankton production and water stability, in summ water dynamics, and in fall by photosynthesis. River regulation has not changed the average oxygen content of the sea water nor reduced the nutrient supply. As a result of massive growth of Cyanophyta following river regulation, eutrophic conditions have spread to the Gulf of Taganrog. The area of oxygen depletion since regulation has increased to include the middle portion of the sea and the region of the Zhelezinskaya bank. (See also W72-05499) (Josefson-USGS) W72-05502

QUANTITATIVE DISTRIBUTION OF ZINC IN WATERS OF THE SEA OF AZOV (KOLICHESTVENNOYE RASPREDELENIYE TSINKA V VODE AZOVSKOGO MORYA),

Institute of Biology of Southern Seas, Sevastopol (USSR).

L. I. Rozhanskaya.

In: Khimicheskiye resursy morey i okeanov; 'Nauka', Moscow, p 115-117, 1970. 1 fig, 1 tab, 7

Descriptors: \*Water chemistry, \*Water analysis, \*Sea water, Surface waters, Littoral, Inflow, Mixing, Chemical predipitation, Organic matter, Sampling, Seasonal. Identifiers: \*USSR, \*Sea of Azov, \*Black Sea,

\*Zinc, Benthonic water, Mineralization.

The content and distribution of zinc in waters of the Sea of Azov in July and October 1964 and in April 1965 were examined. Zinc concentration in the surface laver varied between 3.0 and 24.1 micrograms/liter and in the bottom layer between 12.4 and 22.8 micrograms/liter. Lowest zinc values for surface waters were recorded in July and October in the middle of the sea and in April in the southeastern part. Zinc concentration in the bottom layer in April and July was slightly higher than that in the surface layer. In April this increase was observed mainly in the eastern half of the sea where surface waters were affected by the inflow of water from the Kuban and Protoka Rivers. In summer this increase was associated with highly intensive mineralization of organic matter and precipitation of zinc. In October, as a result of reduced mineralization and more vigorous mixing of waters, zinc content in the surface and bottom layers was the same. (See also W72-05499) (Josefson-USGS)

BIOGENOUS SUBSTANCES IN DEEP WATERS OF THE CASPIAN SEA (BIOGENNYYE ELE- MENTY V VODAKH GLUBOKOVODNOY CHASTI KASPIYSKOGO MORYA), State Oceanographic Inst. Moscow (USSR). A. S. Pakhomova.

In: Khimicheskiye resursy morey i okeanov; 'Nauka', Moscow, p 118-126, 1970. 3 fig, 6 tab, 4

Descriptors: \*Water chemistry, \*Chemical analysis, "Water analysis, "Phosphorus compounds, "Nitrogen compounds, Phosphates, Nitrates, Nitrites, Oxygen, Gases, Photosynthesis, Water circulation, Mixing, Aeration, River regulation, Deep water, Sea water, Diatoms, Phytoplankton,

Identifiers: \*USSR, \*Caspian Sea, \*Biogenous substances, \*Silicon, Mineralization.

Investigations were conducted in 1959-63 by the State Oceanographic Institute to study the content of phosphates, nitrates, nitrites, and silicon in deep waters of the Caspian Sea. Absolute content of these substances in 1959-63 was lower than that in 1934-43 and was due mainly to curtailment of flow from the Volga River. Distribution of substances was more uniform owing to recent intensified vertical circulation of the waters. Maximum concentrations were observed in winter and fall: minimum concentrations occurred in spring and summer. Biogenous substances were often not found in the zone of photosynthesis. Nitrites and nitrates were the first to decline, followed by phosphates. Silicon content rarely dropped below 100 micrograms/liter. Changes in the regime of biogenous substances were related to change in the sea's gas regime. Intensified vertical mixing of waters improved the aeration of deep layers and increased the rate of physico-chemical and biochemical exchange in the water. A quantitative relationship was established between P and O2, which was particularly evident in the zone below 100 m, where the environment was relatively sta-ble. (See also W72-05499) (Josefson-USGS) W72-05504

USE OF THE LUMINESCENT METHOD TO STUDY ORGANIC MATTER OF NATURAL AND POLLUTED RIVER WATERS LUTED RIVER WATERS
E LYUMINESTSENTNOGO
PRI IZUCHFNIT PRIMENENIYE METODA PRI IZUCHENII OR-GANICHESKOGO VESHCHESTVA CHISTYKH I ZAGRYAZNENNYKH RECHNYKH VOD), Akademiya Nauk SSSR, Moscow. Institut Biologii

Vnutrennykh Vod. V. Ye. Sinel'nikov.

In: Khimicheskiye resursy morey i okeanov; 'Nauka', Moscow, p 193-201, 1970. 1 fig, 4 tab, 20

Descriptors: \*Water chemistry, \*Water analysis, \*Chemical analysis, \*Analytical techniques, \*Organic matter, Organic compounds, Fulvic acids, Humus, Bituminous materials, Oil wastes, pollution sources, Solubility, Fluorescence, Color, ampling, Instrumentation.

Identifiers: \*USSR, Moscow River, Oka River, Volga River, Luminescence, Bitumen, Asphaltenes, Natural waters, River waters.

Water samples collected in June-August 1965 from the Moscow, Oka, and Volga Rivers were analyzed by the luminescent-capillary method to study fulvic acids, which are one of the causes of luminescence of water, and bitumens, which often pollute open-water bodies. Liminescent compounds were divided into substances soluble and insoluble in organic solvents. Bitumen content and composition of individual fractions in natural and polluted reaches of the Moscow River varied considerably. Maximum bitumen content (4.9-1.8 mg/liter) was observed in the river waters within city limits. These waters were represented by heavy bituminous-asphaltene fractions of low migration capacity located near sources of open-water pollution by petroleum derivatives. The bitumen content 50 km or more from the pollution source was 0.47-0.33 mg/liter and was represented by fractions whose migration capacity was quite

#### Chemical Processes—Group 2K

high. Bitumen content in waters of the Oka River near Dzerzhinsk varied between 0.024 and 0.036 mg/liter. The light-colored humus fraction in waters of the Oka River and Gor'kiy Reservoir was predominant and represented 81.5%-95% of the total luminescent material. (See also W72-05499) (Josefson-USGS) W72-05505

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INVESTIGATION OF FOAM AS A MEANS OF DETECTING SMALL CONCENTRATIONS OF MINERAL AND ORGANIC SUBSTANCES IN NATURAL WATERS (ISSLEDOVANIYE PENY KAK METOD OBNARUZHENIYA MINERAL'NYKH I ORGANICHESKIKH VESHCHESTV, SODERZHASHCHIK HSYA V PRIRODNYKH VODAKH V MALYKH KOLICHESTVAKH), Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.

Nature Mark Sosk, Moscow, Institute Biologic Vinutrennykh Vod.
S. M. Drachev, and A. A. Bylinkina.
In: Khimicheskiye resursy morey i okeanov;
'Nauka', Moscow, p 202-208, 1970. 6 tab, 7 ref.

Descriptors: \*Water chemistry, \*Foam separa-tion, \*Foam fractionation, \*Organic matter, \*Inor-ganic compounds, Iron, Manganese, Phosphorus, Carbon, Nitrogen, Oxidation, Biochemical oxygen demand, Radioactivity, Radioactive wastes, Waste water (Pollution), Water pollution sources, Algae, Plankton, Seasonal. Identifiers: \*USSR, Moscow River, Oka River,

Formation of foam on natural and polluted waters of the Moscow and Oka Rivers in the fall of 1964 and summer of 1965 is described. The content of organic matter in dry foam residue formed during foam breakage is usually high and often exceeds 50%. Organic carbon-nitrogen ratios and concentrations in a polluted reach of the Moscow River decreased with increasing distance from the source of pollution. A high Fe, Mn, and P content was observed in the foam. The level of radioactivity in foam samples collected from natural waters was higher than that in water and indicated considerable concentration of uranium fission products. Higher radioactivity in foam is presumed to be related to accumulation of iron hydroxides and surface-active substances individual in the surface active substances in the surface in the surfa troduced with domestic and industrial wastes. (See also W72-05499) (Fosefson-USGS) W72-05506

COMPARATIVE GEOCHEMICAL DESCRIP-TION OF ORGANIC MATTER IN RECENT SEDIMENTS OF WESTERN AND EASTERN SLOPES OF THE SOUTHERN CASPIAN BASIN (SRAVNITEL'NAYA GEOKHIMICESKAYA (SKAVNITEL'NATA
KHARAKTERISTIKA ORGANICHESKOGO
VESHCHESTVA SOVREMENNYKH OSADKOV
ZAPADNOGO I VOSTOCHNOGO SKLONOV
YUZHNO-KASPIYSKOY VPADINY),
Azerbaidzhanskii Nauchno-Issledovatelsii Institut

Po Dobyche Nefti, Baku (USSR).
A. A. Ali-Zade, V. V. Veber, and P. A. Shoykhet.
In: Khimicheskiye resursy morey i okeanov;
'Nauka', Moscow, p 215-225, 1970. 2 fig, 5 tab, 11

Descriptors: \*Geochemistry, \*Water chemistry, \*Chemical properties, \*Sediments, \*Organic Descriptors: "Geochemistry, "Water Chemistle, "Chemical properties, "Sediments, "Organic matter, Particle size, Hydrogen ion concentration, Oxidation-reduction potential, Oxidation lagoons, Bituminous materials, Oil, Resins, Iron, Sulfur, Weathering, Deep water, Shallow water, Littoral. Identifiers: \*USSR, \*Caspian Sea, \*Hydrocarbons, \*Bitumen, Asphaltenes, Sedimentary facies.

Geochemical descriptions of organic matter in recent sediments of the Southern Caspian are based on quantitative content of organic carbon, bitumen, and humic substances; hydrocarbon content; and on data relating to the oxidation-reduc-tion state of sediments (Eh, pH, ratio of reduced and oxidized forms of iron and sulfur). Slopes of the southern part of the Caspian Sea are a favora-ble environment for accumulation of organic matter in sediments. Terrigenous and calcareous sediments of different facies (from lagoon to deep water) and different particle sizes are charac-terized in most cases by a reducing medium favor-ing formation of hydrocarbons. A higher hydrocarbon content is more characteristic of facies of lagoons and semiclosed gulf and of shallow-water facies of shelves. Littoral conditions and conditions in which sediments are subjected to subaerial weathering are not conducive to hydrocarbon for-mation. (See also W72-05499) (Josefson-USGS)

COMPOSITION OF ORGANIC MATTER IN BOTTOM SEDIMENTS OF THE BLACK SEA (OSOBENNOSTI SOSTAVA OR-GANICHESKOGO VESHCHESTVA BOKOVODNYKH OSADKOV CHERNOGO MORYA), Moscow State Univ. (USSR).

For primary bibliographic entry see Field 02J. W72-05508

A COMPARISON STUDY OF DETECTION LIMITS USING FLAME-EMISSION SPECTROSCOPY WITH THE NITROUS OXIDE-ACETYLENE FLAME AND ATOMIC-ABSORPTION SPECTROSCOPY, Kentucky Univ., Lexington. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W72-05588

THE ELECTRON CAPTURE DETECTOR-A

NEW MODE OF OPERATION, Reading Univ. (England). For primary bibliographic entry see Field 07B. W72-05590

ELIMINATION OF PHOSPHORUS INTERFERENCE IN THE COLORIMETRIC DETER-MINATION OF SILICON IN BIOLOGICAL MATERIAL.

Dow Corning Corporate Center, Midland, Mich. Biomedical Research and Development. For primary bibliographic entry see Field 05A. W72-05591

A SYSTEMATIC STUDY OF THE QUANTITA-TIVE EFFECTS OF INSTRUMENT CONTROL ON ANALYTICAL PRECISION IN FLAME IONIZATION GAS CHROMATOGRAPHY, Coal Tar Research Association, Gomersal (En-

D. W. Grant, and A. Clarke.

Analytical Chemistry, Vol. 43, No. 14, p 1951-1957, December 1971. 1 fig, 8 tab, 6 ref.

Descriptors: \*Gas chromatography, \*Evaluation, \*Statistical methods, Flow rates, Ethers, Tem-perature, Gases, Argon, Methane, Nitrogen, Hydrogen.

Identifiers: \*Instrument control, Flame ionization detector, Carrier gas, Carbon monoxide, Ethyl benzene, Butyl acetate, o-Xylene, cis-Dekalin, Diethyl ether, Cyclohexane, Methanol, Benzene, Propanol, Toluene, Tetradecane, Indene, Hexadecane, Katharometer, Precision.

Statistical experiments have been performed to investigate the effects of variations in gas flow rates, detector temperature, sample injection conditions, detector polarization voltage, and method of peak measurement, on analytical precision. The results of the experiments, in which n-propanol, n-butyl of the experiments, in which n-propanol, n-butyl acetate, o-xylene, chlorobenzene, cis-dekalin, ethyl benzene, and other compounds were analyzed, show that analytical precision in gas chromatography depends upon the control and setting of the instrumental variables and the analytical technique. On the basis of the results, estimates can be made of the precision of instrumental variables are the precision of instrumental variables. mental control necessary to achieve set precision levels in analysis. Recommendations are made for achieving higher than normal precision, particularly in relation to peak measurement, sample introduction, and the use of internal standards. (Holoman-Battelle)

LOPEZ WATER SUPPLY PROJECT, Koebig and Koebig, Inc., Los Angeles, Calif. For primary bibliographic entry see Field 04A. W72-05594

SAMPLING IMPROVEMENTS IN ATOMIC AB-SORPTION SPECTROSCOPY,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A. W72-05597

IN SITU MOLECULAR PROFILER: A QUANTITATIVE EVALUATION OF PERFORMANCE,
National Marine Fisheries Service, Miami, Fla. Tropical Atlantic Biological Lab. For primary bibliographic entry see Field 05A. W72-05602

IDENTIFICATION OF THE DERIVATIVES EM-PLOYED IN THE CONFIRMATION OF DIEL-DRIN RESIDUES, Department of Agriculture, Ottawa (Ontario).

Analytical Services Section. For primary bibliographic entry see Field 05A. W72-05603

PHOSPHORIMETRY OF CHLORO- AND NITRO-AROMATIC FUNGICIDES, National Research Council of Canada, Halifax (Nova Scotia). Atlantic Regional Lab. For primary bibliographic entry see Field 05A. W72-05609

PRESENT AND FUTURE SALINITY OF COLORADO RIVER,
Colorado River Board of California, Los Angeles. For primary bibliographic entry see Field 05B. W72-05625

PORE FLUIDS OF RECENT MARINE SEDI-MENTS: II. ANOXIC SEDIMENTS OF 35 DEG TO 45 DEG N, GIBRALTAR TO MID-ATLA-NTIC RIDGE, University of Southern California, Los Angeles.

Dept. of Geology. J. L. Bischoff, and T. L. Ku.

Journal of Sedimentary Petrology, Vol 41, No 4, p 1008-1017, December 1971. 2 fig, 3 tab, 21 ref.

Descriptors: \*Water chemistry, \*Connate water, Bottom sediments, Atlantic Ocean, Sea water, Diagenesis, Oxidation-reduction potential, Chlorides, Sulfates, Magnesium, Potassium, Silica, Calcium, Manganese. Identifiers: Pore water chemistry.

Pore water composition was studied in samples from Straits of Gibraltar to the Mid-Atlantic Ridge. The near shore sediments are strongly reducing while the deep sea samples are mildly reducing. The deep sea samples displayed Mn (++) gradients which indicate recycling of this element in large areas of the sea floor. Constancy of Cl (-), SO4 (--), and Ca (++) appears to be general, as does Mg (++) depletions, K (+) enrichment and enrichments in SiO2, B, and Li. Pore water chemistry of near shore strongly reducing sediments (in which organic matter is abundant) contrasts markedly with both deep deep sea reduc-ing and oxidizing sediments. SO4 (--) removal and Mg (++) and Ca (++) removal with depth are common. (Knapp-USGS) W72-05627

#### **Group 2K—Chemical Processes**

CHEMICAL WEATHERING IN A SUBTROPI-CAL IGNEOUS TERRAIN, RIO AMECA, MEX-ICO.

Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.

J. I. Drever.

Journal of Sedimentary Petrology, Vol 41, No 4, p
951-961, December 1971. 7 fig, 4 tab, 32 ref. NSF
Grant GA-985.

Descriptors: \*Weathering, \*Leaching, \*Soil formation, \*Clay minerals, Mineralogy, Water chemistry, Igneous rocks, Climates, Tropical regions, Topography. Identifiers: Mexico.

The Rio Ameca drainage basin of Mexico is underlain almost entirely by igneous rocks. The principal clay minerals forming in the soils are halloysite, kaolinite, and montmorillonite. The clay mineralogy of the stream sediments generally corresponds to the soil-clay mineralogy in the drainage basin, but montmorillonite appears to be overrepresented in sediments compared to the areal abundance of montmorillonitic soils. Stream water chemistry is strongly influenced by the porosity and reactivity of the rocks in the drainage basin. Water draining Tertiary andesites of low porosity contain less than 200 ppm total dissolved solids. Streams draining an unconsolidated rhyolite ash have up to 820 ppm total dissolved rhyolite ash have up to 820 ppm total dissolved rhyolite ash and the soil formed on the ash. Alstream water analyses except those from streams draining the rhyolite ash plot close to the montmorillonite-kaolinite phase boundary. Those from the ash are in the montmorillonite stability field, although halloysite is the principal clay mineral forming in the soil on the ash. The chemical denudation rate of the low porosity andesites is 28 metric tons per sq km per yr, a typical value for silicate weathering. The rate for the ash is 91 tons per sq km per yr, showing the influence of highly reactive starting material. (Knapp-USGS)

A STUDY OF THE CHEMICAL QUALITY OF STREAMFLOW IN ARKANSAS, Geological Survey, Washington, D.C.

T. D. Steele.
Geological Survey Open-file Report, October 1971. 93 p, 8 fig, 26 tab, 9 ref.

Descriptors: \*Water quality, \*Chemical analysis, \*Streamflow, \*Flow rates, \*Arkansas, Hydrologic data, Regression analysis, Forecasting, Statistical methods, Data collections, Time series analysis. Identifiers: \*Water quality-streamflow relationships of the control of the con

Historical records of streamflow chemical quality of 16 Arkansas water quality stations, representing more than 102 station-years of data and over 6200 composited samples, are analyzed graphically and statistically. A sequential procedure is described for analyzing data. A summary for each sampling station includes basic statistics for the period of record, plots of selected data pairs, and regression relationships derived from the historical water-quality data available for that location. A technique is shown for simulating concentrations and loads of major inorganic solutes using supplemental records of specific conductance, stream discharge, and applicable concentration-conductance regression equations. Preliminary simulation studies revealed that monthly mean values could be estimated to within 15-25% of actual determinations for an independent period of record or set of data. Annual mean concentrations and loads for dominant ions estimated from the regression relationships seldom exceeded 15% in error relative to comparable values computed from actual data. Other procedures in data analysis include examples from transferring information on streamflow chemical quality both in time and space and for assessing long-term trends in streamflow salinity. (Woodard-USGS)

TRAVEL OF NITROGEN IN SOILS, Minnesota Univ., Minneapolis. Dept. of Civil Engineering. For primary bibliographic entry see Field 05B. W72-05695

A COMPARISON OF SOME METHODS FOR TOTAL PHOSPHATE ANALYSES, National Inst. for Water Research, Pretoria (South Africa). For primary bibliographic entry see Field 05A. W72-05699

HYDROLOGY AND GEOCHEMISTRY OF ABERT, SUMMER, AND GOOSE LAKES, AND OTHER CLOSED-BASIN LAKES IN SOUTH-CENTRAL OREGON, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02H.

W72-05846

EARLY DIAGENESIS OF CLAY MINERALS, RIO AMECA BASIN, MEXICO, Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div. For primary bibliographic entry see Field 02L. W72-05850

MOVEMENT OF CHLORIDE AND SODIUM IONS IN UNSATURATED SOIL DURING EVAPORATION (PEREDVIZHENIYE IONOV KHLORA I NATRIYA V NENASYSHCHENNOY POCHVE PRI ISPARENII).

POCHVE PRI ISPARENII), Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). S. M. Pakshina.

Pochvovedeniye, No 6, p 117-120, June 1971. 2 fig, 11 ref.

Descriptors: \*Ion transport, \*Ion exchange, \*Soil water movement, \*Evaporation, \*Salts, Chlorides, Sodium, Calcium, Soil moisture, Moisture content, Soil analysis, Laboratory tests, Separation techniques, Sampling, Electrodialysis, Diffusion.
Identifiers: \*USSR, Water films, Hygroscopicity.

The transport of Na and Cl ions from a water and sodium chloride source into air-dry soil during evaporation is described. Transport of salt anions and cations depends to varying degrees on the thickness of the water-conducting film. When film thickness corresponds roughly to maximum hygroscopicity, the Cl ion is impeded and a maximum Cl content is formed, while the content of the Na ion varies continuously form the source to the soil surface. The film thickness decrease at the boundary between saturated and air-dry soil causes resistance to transport of anions by reducing the separation of the anions from the negatively charged surface of soil particles, but does not increase resistance to the movement of cations. The process of separation of ions by thin liquid films disrupts the proportionality in ion transport within a unit of transported water, resulting in diffusion of ions throughout the soil profile. (Josefson-USGS)

GEOCHEMISTRY OF ORGANIC MATTER IN
GROUNDWATER (K GEOKHIMII ORGANICHESKIKH VESHCHESTV PODZEMNYKH VOD),
All-Union Scientific Research Inst. of

All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).

V. M. Shvets.

Byulleten' Moskovskogo Obshchestva Ispytateley Prirody, Otdel Geologicheskiy, Vol 46, No 5, p 122-134, September-October 1971. 3 fig, 2 tab, 28 ref.

Descriptors: \*Geochemistry, \*Groundwater, \*Organic matter, Organic compounds, Organic acids, Soil types, Sediments, Rocks, Coals, Peat, Oil,

Natural gas, Aqueous solutions, Surface waters, Sea water, Confined water, Precipitation (Atmospheric), Infiltration, Microbiology, Chemical reactions. Identifiers: \*USSR, Natural waters, Hydrocar-

Sources of organic-matter uptake by groundwaters are examined in terms of methods of conversion of organic matter to a water-soluble state and its composition, content, and distribution in groundwaters. Organic matter is considered in the following natural occurrences: (1) soils; (2) sea and ocean cozes; (3) rocks; (4) groundwaters; (5) soil solutions; (6) pore solutions; (7) water extracts (rocks); (8) sediments; (9) water extracts (oil); (10) surface-water runoff; (11) sea water; and (12) atmospheric precipitation. The basic processes by which organic matter enters groundwater are: (1) migration from the earth's surface in infiltration stages and from sea basins in sedimentation stages; and (2) solution from rocks and oil. The amount of organic carbon in groundwaters in a 5-km depth of the earth's crust (50 million cu km) is about the same as that found in the world's oceans, coal, peat, and soils, and is exceeded only by the amount of organic carbon in sedimentary rocks. (Josefson-USGS) W72-05865

AQUATIC PLANTS FROM MINNESOTA PART 1 - CHEMICAL SURVEY, SA BA FF HA Sa Bo Ac 19 Ide Do Ps

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Minnesota Univ., Minneapolis. Water Resources Research Center.

K. Lee Su, and E. J. Staba.

Available from the National Technical Information Service as PB-207 474, \$3.00 in paper copy, \$0.95 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 46, February 1972, 50 p, 3 fig, 11 tab, 147 ref. OWRR A-025-MINN (2).

Descriptors: \*Aquatic plants, \*Chemical compounds, \*Medicine, \*Minnesota, Alkaloids, Flavonoids, Tannins, Saponins, Steroids, Lipids Phytochemical screening, Chromatography. Identifiers: \*Hemolysis test, \*Froth test \*Methanolysis, Hydrogenation, Dragendorff positive spots, Beta-sitosterol.

The aquatic plants in Minnesota have not been sur veyed medicinally for useful chemical compounds A study was conducted with a reasonable anticipation of finding compounds such as alkaloids, favonoids, tannins, saponins, steroids and lipids which might be useful in medicine. Examination of chemical constituents was accomplished on the following plants collected from various lakes in Minnesota: Anacharis canadensis, Calla Polustris, Carex lacustris, Ceratophyllum demersum, Chara vulgaris, Eleocharis smallii, Lemna Minor, Myriophyllum exalbescens, Nuphar variegatum, Nymphaea tuberosa, Potamogeton amplifolius, P. natans, P. pectinatus, P. richardsonu, P. zosteriformis, Sagittaria cuneata, S. latifolia, Sparganium eurycarpum, S. fluctuans, Typha angustifolia, Vallisneria americana, and Zizania aquetica. Taxonomic identification of aquatic plants was made and exhaustive extraction using solvents ranging from the non-polar to polar type was followed to determine the nature of the various constituents present in the aquatic plants. Detection for compounds involved purification of extracts, thin-layer chromatography, hemolysis test, froth test, gravimetric determination, methanolysis, and hydrogenation. Thin-layer chromatographic detection studies indicated original extracts did not appear to contain alkaloids. Several plant species demonstrated Dragendorff positive spots. Flavonols were most widely distributed in the plant extracts studies. Tannins, especially the condensed type, were widely distributed in the plant extracts studies. Thin-layer chromatography between the plants screened. Five species of plants are saponin positive. Beta-sitosterol was tentatively identified as being present in 8 species. The Lipid contents of 3 species may be considered for their nutritiona value. W72-05877

#### 2L. Estuaries

WATER SAMPLING APPARATUS, Department of the Navy, Washington, D. C. (As-For primary bibliographic entry see Field 07B. W72-05299

WATER SAMPLER DEVICE, For primary bibliographic entry see Field 07B. W72-05304

OPTIMAL WATER QUALITY MANAGEMENT FIRMAL WAIER QUALITY MANAGEMENT FOR THE HOUSTON SHIP CHANNEL, Tracor, Inc., Austin, Tex. Environmental Science and Engineering Section. For primary bibliographic entry see Field 05G. W72-05323

SALINITY TOLERANCE OF SOME DOMINANT BACTERIA AND ACTINOMYCETES FROM FRESHWATER, ESTUARINE AND MARINE HABITATS, Sarajevo Univ. (Yugoslavia). Bioloski Institut.

Bosiljka Ristanovic. Acta Biol Jugoslav Ser B Mikrobiol. 6 (2): 235-251.

1969. Illus. English summary.
Identifiers: Actinomycetes, Bacillus, Bacteria,
Dominant, Estuarine, Fresh, Habitats, Marine,
Pseudomonas, Salinity, Tolerance.

Dominant bacteria and actinomycetes were isolated from habitats of different salinity. Pure cultures were used that were neither older than 1 mo. nor more than 5 generations from the moment of isolation from the natural habitats. Pure culture of microorganisms were cultivated in vitro on solid nutrient media containing salt concentrations of 0.00%-10.00% NaCl. Bacteria from 3 habitats are able to grow in zero or low concentrations of NaCl, as well as in the concentration of sea water. Bacteria from brackish water are better adapted for growing in higher concentrations of NaCl than freshwater bacteria. The lethal level of NaCl for freshwater bacteria is lower than for brackish and seawater isolates. There is a statistically signifi-cant difference in the behavior of the genera Pseu-domonas and Bacillus to different concentrations of NaCl, dependent on the natural salinity sources from which they are isolated. Actinomycetes from all of 3 aquatic habitats (fresh, brackish and sea-water) grow best on the media without NaCl and in low concentrations but those originating from seawater grow a little better in higher concentrations of NaCl. Bacteria and Actinomycete cultures grow best on nutrient media with the same or nearly the same concentrations of NaCl as in natural habitats from which they are isolated.—Copyright 1971, Biological Abstracts, Inc. W72-05366

GAMMARIDAE FROM THE CONTINENTAL AND BRACKISH WATERS OF THE SOUTHEASTERN ARMORICAN REGION AND THE NORTHERN AQUITAINE BASIN, Amsterdam Univ. (Netherland). Inst. of Tax-

J. M. J. F. Gras, and A. M. J. Maasen.
Bijdr Dier. 41 (1): 52-60. 1971. Illus. Maps. English

Identifiers: Aquitaine, Armorican, Basin, Brackish, Continental, Echinogammarus-Spinulicornis, France, Gammaridae, Gammarus-Zad-

Fieldwork in French departments along the Atlantic coast from southern Brittany to the northern part of the Aquitaine Basin revealed 324 inland part of the Aquitaine Basin revealed 324 inland and brackish localities with gammarids. Particularly interesting are 21 new stations of Echinogamarus spinulicornis (which was known from 3 places only, all more to the south). This species prefers the mid-course of rivers, especially habitats without vegetation. Gammarus zaddachi is recorded for the 1st time south of the Loire.—Copyright 1971, Biological Abstracts, Inc. W72-05387

TWO NEW LIMNIC ECHINOGAMMARUS FROM THE AQUITAINE BASIN,

Amsterdam Univ. (Netherlands). Inst. of Tax-onomic Zoology. S. Pinkster, and J. H. Stock. Bijdr Dier. 41 (1): 37-51. 1971. Illus. Maps. English

Identifiers: Aquitaine, Basin, Echinogammarus, Echinogammarus-Spinulicornis, Echinogammarus-Zebrinus, France, Limnic, Species.

Descriptions are given of E. spinulicornis, closely related to E. pungens (H. Milne Edwards), and of E. zebrinus, a member of the E. berilloni-group, from streams in the Basin of Aquitaine, southwestern France.—Copyright 1971, Biological Abstracts, Inc. W72-05388

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 5 AND 6. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS, AND MISSOURI RIVER BASIN. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-05415

MACROZOOPLANKTON AND SMALL NEKTON IN THE COASTAL WATERS OFF VANCOUVER ISLAND (CANADA) AND WASHING-TON, SPRING AND FALL OF 1963, National Marine Fisheries Service, Washington,

For primary bibliographic entry see Field 05C. W72-05426

TWO SIMPLE DURABLE EPIFAUNAL COL-

Laval Univ., Quebec. Departement de Biologie. For primary bibliographic entry see Field 05Å. W72-05432

AN ECOLOGICAL STUDY OF A POOL SUB-JECT TO VARYING SALINITY (SWANPOOL, FALMOUTH), Bristol Univ. (England). Dept. of Zoology. For primary bibliographic entry see Field 05C. W72-05466

OBSERVATIONS ON OYSTER BREEDING IN CUBA: I. PLANKTON COMPOSITION, Brussels Univ. (Belgium). Lab. Ekol. Syst. F. Lambert, and P. Polk.

Hydrobiologia. 38 (1): 9-14. 1971. Illus. Identifiers: Breeding, Composition, Crassostrea-Rhizophorae, Crustacea, Cuba, Echinodermata, Fish, Hydromedusa, Oys Polychaeta, Protozoa, Tunicata. Oyster,

A first qualitative analysis of monthly samples of A tirst qualitative analysis of monthly samples of zooplankton during the period Dec. 1967-Nov. 1968, yielded information on the most advantageous time for gathering Crassostrea rhizophorae at Casilda (Cuba). The most frequent plankton groups were: Protozoa (Tintinnidae, Foraminifera, Radiolaria, and Dinoflagellata), Hydromedusa, meroplanktonic larvae of Gastronda Rivalvia Echindeternata Polychaeta and tropoda, Bivalvia, Echinodermata, Polychaeta and Crustacea (Cirripeda: Balanomorpha and Lepadomorpha, Decapoda: zoea) holoplanktonic organisms (Copepoda, Branchipoda, Mysidacea and Isopda), Tunicata (Larvacea) and fish eggs and larvae.--Copyright 1971, Biological Abstracts, W72-05496

CHEMICAL RESOURCES OF SEAS AND OCEANS (KHIMICHESKIYE RESURSY MOREY I OKEANOV).
Akademiya Nauk SSSR, Moscow. Okeanograficheskaya Komissiya.
For primary bibliographic entry see Field 02K.

W72-05499

CONNATE-WATER SOLUTIONS OF THE BAL-TIC SEA AND GULF OF RIGA (GRUNTOVYYE RASTVORY BALTIYSKOGO MORYA I RIZH-

SKOGO ZALIVA),
All-Union Research Inst. of Marine Fisheries and
Oceanography, Moscow (USSR).
For primary bibliographic entry see Field 02K.
W72-05500

CALCULATION OF FREE CO2 AND IN-DIVIDUAL FORMS OF SULFUR COMPOUNDS DIVIDUAL FORMS OF SULFUR COMPOUNDS IN WATERS OF THE BLACK SEA (RASCHET SODERZHANIYA SVOBODNOY UGLEKIS-LOTY I OTDEL'NYKH FORM SERNISTYKH SOYEDINENIY V VODE CHERNOGO MORYA), Akademiya Nauk URSR, Sevastopol. Marine Hydrophysics Inst. For primary bibliographic entry see Field 02K. W72-05501

THE DISTRIBUTION OF RICCIOCARPUS NATANS (L.) CORDA IN THE WATERS OF THE AMU-DAR'YA DELTA,

K. Butov. Vestn Karakalp Fil Akad Nauk Uz SSR. 2 (40): 87-

Identifiers: Amu-Darya, Delta, Distribution, Lemna-Minor-M, Low, Ricciocarpus-Natans, Sal-vinia-Natans-P, USSR.

R. natans is often found in the waters of the lower delta, forming pure thickets or societies with Salvinia natans and Lemna minor. The wide distribution of the species is caused by the abrupt fall in the water level in the last 10 yr and by the general shoaling of the waters.--Copyright 1971, Biological Abstracts, Inc. W72-05558

THE LIST OF COPEPOD SPECIES FOUND IN THE WATERS OF THE ROMANIAN LITTORAL OF THE BLACK SEA AND IN SINOE LAGOON. (IN RUMANIAN), Muzeul de Istorie Naturala 'Grigore Antipa',

Bucharest (Rumania). Amelie Marcus.

Trav Mus Hist Natur Grigore Antipa. 10. 7-17.

1970. Russian summary.
Identifiers: Acanthocyclops-Americanus,
Acanthocyclops-Vernalis, Black, Copepod,
Lagoon, List, Littoral, Romanian, Salinity, Sea, Sinoe, Species.

The various studies conducted on the copepods of the Romanian littoral of the Black Sea and of Sinoe Lagoon are described, as is a list of the known species. This list is composed of 141 ssp.: 14 planktonic species (9 calanoids, 3 cyclopods, and 2 monstrilloids), 100 benthonic species (harpacticoids), and 8 associated species (cyclopoids and harpacticoids). Two freshwater cyclopoids, Acanthocyclops vernalis (Fischer) and A. amer-icanus (Marsch) appeared sporadically and only under conditions of reduced salinity. The copepods are of systematic, biological and copepods are of systematic, hological and economic interest; this group composes one of the main elements in the nutrition of planktonophagous and benthophagous fish. Their mode of living, their biotope and the studies in which they are mentioned are discussed.—Copyright 1971, Biological Abstracts, Inc. W72-05562

THE BIOLOGY OF ACETES ERYTHRAEUS (SERGESTIDAE) IN A BAY OF (SERGESTIDAE) IN A BAY OF NORTHWESTERN MADAGASCAR (AMBARO

BAY) (IN FRENCH), Office de la Recherche Scientifique et Technique Outre-Mer, Nosy-Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy Be.

L. Le Reste.
Cah O.R.S.T.O.M. Office Rech Sci Tech Outre-Mer Oceanogr. 8 (2): 35-56. Illus. Maps. 1970. Enelish summary.

#### **Group 2L—Estuaries**

Identifiers: Acetes-Erythraeus, Ambaro, Bay, Biology, Madagascar, Northwestern, Sergestidae.

The biology of Acetes erythraeus was studied from adults collected in the Ambaro bay (northwest coast of Madagascar) and in the Ambazoana estuary which flows in it. Plankton samples were collected in the bay only. The nocturnal activity rhythm for adults is studied. Adult abundance involves seasonal fluctuations both in the bay and the estuary. These fluctuations are brought about by the dynamics of water which involves seasonal fluctuations in the adult distribution area; a seasonal rhythm, the nature of which is probably biological. In the bay, spawning takes place during the rainy season. Sometimes another smaller spawning season is recorded in the last part of the dry season .-- Copyright 1971, Biological Abstracts, Inc. W72-05574

VERTICAL DISTRIBUTION PHOTOSYNTHETIC PIGMENTS AND THE PENETRATION OF LIGHT IN MARINE SEDI-

Copenhagen Univ., Helsingoer (Denmark). Marine Biological Lab

For primary bibliographic entry see Field 05A.

W72-05619

ESTIMATING DISPERSION COEFFICIENTS IN ESTUARIES.

Oregon State Univ., Corvallis. Dept. of Civil En-

gineering. D. A. Bella, and W. J. Grenney. Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY3, p 585-589, March 1972. 2 tab, 10 ref, append. EPA Grant 16070 DGO, NSF Grant GK-3656.

Descriptors: \*Saline water intrusion, \*Estuaries, \*Dispersion, \*Numerical analysis, Model studies, Mathematical models, Oregon, Mixing, Salinity, Tides. Streamflow.

Estuarine dispersion coefficients were determined from steady state salinity profiles. This approach assumes a balance between the seaward advective flux due to the fresh water flow and the landward flux due to longitudinal dispersion. A one-dimensional finite-difference model was utilized to investigate the adequacy of the equations. The model was based on data collected within the Yaquina Estuary located at Newport, Ore. Intertidal variations of water flow were incorporated into the model. Long term simulation runs were obtained by repeating the flow variations of a single tidal cycle. The calculated dispersion coeffi-cients were usually within 5% to 20% of the known value. (Knapp-USGS) W72-05623

SIZE MODES IN BIOGENIC CARBONATE SIZE MODES IN BIOGENIC CARBONATE SEDIMENT, SOUTHEASTERN ALASKA, Alaska Univ., College. Inst. of Marine Science; and Alaska Univ., College. Dept. of Geology. For primary bibliographic entry see Field 02J. W72-05631

EFFLUENT EXPANSION AND INTERFACIAL MIXING IN THE PRESENCE OF A SALT WEDGE, MISSISSIPPI RIVER DELTA, Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

L. D. Wright, and J. M. Coleman.

Journal of Geophysical Research, Vol 76, No 36, p 8649-8661, December 20, 1971. 7 fig, 17 ref. NR 388 002. Contract N00014-69-A-0211-0003 ONR.

Descriptors: \*Saline water-freshwater interfaces, \*Estuaries, \*Mississippi River, \*Oceans, \*Inlets (Waterways), Mixing, Boundaries (Surfaces), Sea water, Fresh water, Analytical techniques, Remote sensing, Currents (Water), Tides, Runoff,

Ground observations and remote-sensing imagery of the mouth of South Pass, Mississippi River, support the contention that where river efflux takes place above a well defined salt wedge, ef-fluent expansion is primarily a response to the buoyancy of the lighter river water. Flow deceleration and fresh-water deconcentration are for the most part the result of vertical mixing across the fresh-water-salt-water interface by interfacial waves. However, rough seas and tidal currents augment mixing and influence effluent geometry to a significant extent. These conclusions apply only to cases where the salt wedge intrudes into the lower reaches of the river channel. During flood stage, when the salt wedge is flushed out of the channel, a different set of mechanisms prevails. (Woodard-USGS)
W72-05648 72-05648

TEMPERATURES AND SALINITY DISTRIBU-TIONS IN VERTICAL SECTIONS ALONG THE LONGITUDINAL AXIS AND ACROSS THE EN-TRANCE OF THE CHESAPEAKE BAY (APRIL 1968 TO MARCH 1969), Johns Hopkins Univ., Baltimore, Md. Chesapeake

Bay Inst. R. C. Seitz.

Chesapeake Bay Institute Graphical Summary No 5, September 1971. 60 p, 13 fig, 2 tab, 6 ref. NR 083-016. N00014-67-A-0163-0006.

Descriptors: \*Bays, \*Water temperature, \*Saline waterfreshwater interface, \*Data collections, \*Estuaries, Tidal waters, Salinity, Density, Stratified flow, Hydrologic data, Meteorological data, Winds.
Identifiers: \*Chesapeake Bay.

Twelve monthly temperature and salinity sections along the Chesapeake Bay describe a complete an-nual cycle of changes in the physical structure of the Bay. The monthly variations of both the tem-perature and salinity distributions show a much more pronounced two-layered type of circulation pattern in the summer months than in the months from October to December. The density structure was found to be mainly determined by the salinity distribution, however the temperature distribution significantly affects the density stratification in the middle portion of the Bay. In the summer months the vertical stratification of temperature accounted for as much as 18% of the total surface to bottom difference in density. During the course of the entire year temperature effects accounted for 23.2% of the total amount of variation in the surface to bottom density differences. From this it is obvious that the annual temperature cycle in the Chesapeake Bay should be considered when investigating the major circulation of the Bay. (Woodard-USGS) W72-05652

A CONTRIBUTION TO THE BIOLOGY OF FRESHWATER CRABS FROM AZERBAIDZ-HAN, (IN RUSSIAN),

Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Zoologii.

A. G. Kasymov, and A. R. Khalilov.

Zool Zh. 50 (5): 773-775. 1971. English summary. Identifiers: Azerbaidzhan, Biology, Crabs, Fresh,

The period of reproduction of crabs in the water bodies of Azerbaidzhan USSR lasts from Oct. till Jan. Egg laying occurs in the night. The number of eggs varies from 200 to 600. The development of egg proceeds during about 9 mo. The life span is 10 15 yr. The crabs feed on frogs, fishes (bleak, spring roach, mosquitofish, fry of wild carp, bream, roch and sheatfish), earthworms and other obligochaetes, chironomid larvae, terrestrial and aquatic insects. The crabs can affect, to a considerable extent, fish stock and food supply of water bodies .-- Copyright 1971, Biological Abstracts, Inc. W72-05696

INVESTIGATIONS ON OYSTER CULTURE IN THE FLOOD BASIN OF OSTEND IN 1968,

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Institut Royal d Belgique, Brussels. des

Bull Inst Roy Sci Natur Belg. 46 (6): 1-24. 1970. Il-

Identifiers: Basin, Belgium, Culture, Fishery, Flood, Ostend, Ostrea-Edulis, Oyster, Polychaeta.

On the Belgian coast, oysters (Ostrea-edulis) are cultivated only in the flood basin of Ostend. In 1968, experiments were made in the use of a Japanese-made basket or open-mesh box (type A3 of the firm Hamasho Co., Ltd.). Oysters which had been cleaned, measured, and weighed were placed in this box (25 in each of 4 compartments) on April 18, 1968, and the box was sunk and fastened at the foot of a fixed raft. It was kept a little above the bottom in order not to have it sink in the mud. On Oct. 17 the box was raised and 83 oysters were found to be alive. Data on measurements are given. During the same period, 200 oysters were fastened to sticks and immersed, and only 59 were recovered 6 mos. later. Other kinds of animals found with the oysters are listed. Also, 6 spp. of Polychaeta found in the flood basin of Ostend are described.--Copyright 1971, Biological Abstracts, Inc. W72-05734

FOOD HABITS OF JUVENILE POMPANO, TRACHINOTUS CAROLINUS, IN LOUISIANA, Bureau of Sport Fisheries and Wildlife, Vero Beach, Fla.

John W. Bellinger, and James W. Avault. Trans Am Fish Soc. 100 (3): 486-494. 1971. Map. Identifiers: Amphipods, Clams, Copepods, Fishes, Food, Gastropods, Habits, Insects, Juvenile, Louisiana, Mysids, Polychaetes, Pompano, Trachinotus-Carolinus.

Food habits of juvenile T. carolinus in Louisiana were determined during the summer of 1968. Stomachs of 899 juveniles were examined from stations at Grand Isle and Holly Beach, Louisiana. The fish ranged from 10 to 125 mm in total length. Percent frequency of occurrence, percentage of total volume, and seasonal variation in diet were determined. Juvenile pompano in Louisiana ate polychaetes, small clams, gastropod larvae. copepods, mysids, isopods, amphipods, postlarval shrimp, anomurans (sand crabs), brachyurans (juveniles, megalops, and eggs), insects and small fishes. Small juveniles ate a wide variety of organisms and appeared to be opportunistic, apparently feeding on those organisms most abundant at the time. Larger juveniles ate a more limited diet, consisting primarily of coquina clams.--Copyright 1971, Biological Abstracts, Inc. W72-05738

CONSERVATION, POLICY AND THE ROLE OF COUNSEL, Maine Univ., Portland. School of Law

For primary bibliographic entry see Field 06E. W72-05743

EARLY DIAGENESIS OF CLAY MINERALS, RIO AMECA BASIN, MEXICO,

Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.

Journal of Sedimentary Petrology, Vol 41, No 4, p 982-994, December 1971. 9 fig, 4 tab, 33 ref. NSF Grant GA-985

Descriptors: \*Diagenesis, \*Clay minerals, Sea water, Water chemistry, Oxidation-reduction potential, Magnesium, Iron, Sulfides, Potassium, Ion exchange, Sedimentation. Identifiers: Mexico.

In Recent sediments from Banderas Bay, Mexico, the non-exchangeable Mg content of the clay frac-tion is higher, and the Fe content is lower, in sediments from strongly reducing environments than

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### WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

#### Saline Water Conversion—Group 3A

in similar sediments from less reducing environ-ments. Clay mineralogy does not vary significantly in the different environments. The total cation exchange capacity of the clays does not differ in the different environments although exchangeable Na is markedly lower in clays from sulfide-rich sediments. In a strongly reducing environment, Fe leaves the montmorillonite structure to form a sulfide, and Mg enters the same sites from the surrounding water, so that gross clay mineralogy is unchanged. Mg is depleted in the interstitial water of the anoxic sediments and Mg must be diffusing into the sediment from the overlying sea water to account for the increased Mg content of the clay. (Knapp-USGS) W72-05850

#### 03. WATER SUPPLY AUGMENTATION AND CONSERVATION

#### 3A. Saline Water Conversion

MODULAR UNIT ASSEMBLY FOR MULIT-STAGE FLASH DISTILLATION American Machine and Foundry Co., New York.

W. R. Williamson. U.S. Patent No. 3,489,650, 8 p, 14 fig, 11 ref. Official Gazette Vol 870 No. 2, p. 609, January 13,

Descriptors: \*Patents, \*Desalination plants, \*Flash distillation, \*Distillation, Separation techniques, Saline water, Water purification, Water supply, \*Multi-stage flash distillation, Saline water conversion, Water supply augmentation Conference in the Conference of the Conferenc tion, Condensation.

A flash distillation plant is used for sea water desalination. The plant is formed by interconnected modules, each of which includes at least one flash chamber, a corresponding number of condenser chambers, and a conduit or duct for in-terconnecting the flash chamber and the con-denser chamber. The modular units are con-structed to permit heated feed to pass in counterflow to relatively-cool condensing fluid in each stage. (Sinha-OEIS) W72-05298

SEA WATER DESALINATION, Atomic Energy Commission, Washington, D.C. (Assignee). D. Ramaswami, and A. A. Jonke.

U. S. Patent No. 3,491,822, 4 p, 1 fig, 6 ref. Vol 870, No. 4, Official Gazette p. 1178, January 27, 1970.

Descriptors: \*Patents, \*Desalination, \*Evapora-tion, Separation techniques, Water supply, Sea water, Water purification, Water pollution treatment.

The desalination of sea water is achieved in a fluidized bed. Atomized sea water is sprayed into fluidized bed of salt particles. Evaporation of fresh water from the surface of the particles leaves solid salt in the bed but no brine. The total surface area of the heating medium can be controlled by varying the particle and bed size. Larger surface areas mean increased vapor velocities and greater fresh-water production capacity. (Sinha-OEIS) W72-05300

METHOD AND APPARATUS FOR NON-CYCLIC CONCENTRATION OF SOLUTION-SUSPENSION,

For primary bibliographic entry see Field 05D. W72-05307

DISTILLATION SYSTEM AND METHOD,

U. S. Patent No. 3,492,205, 4 p, 1 fig, 13 ref. Official Gazette, Vol. 870, No. 4, p. 1265, January 27,

Descriptors: \*Patents, \*Distillation, Separation techniques, \*Evaporation, \*Refrigeration, \*Desalination, Water supply, Water purification, Water pollution treatment, Pollution abatement, Waste water treatment.

A device that renders water potable may be designed for small or large scale construction. A condenser in a fluid phase-change refrigerating system supplies the heat to evaporate, in one chamber, the solvent of a liquid solution, while an evaporator in the refrigeration system extracts heat, in a connected chamber, from the vaporator in the refrigeration system extracts heat, in a connected chamber, from the vaporation of the connected chamber, and the connected chamber is a second contraction of the connected chamber. produced to condense that vapor and cool the condensate. Additional condenser and evaporator means are included in the system if required to produce the intended distillation effect upon the solution. The system can be used in small sizes, as a portable desalinator or to render potable any water holding noxious solids in solution. (Sinha-OEIS) W72-05309

#### OPTIMIZATION OF A SINGLE EFFECT, MUL-TI-STAGE FLASH DISTILLATION DESALINA-

Western Electric Co., Inc., Princeton, N.J. En-

gineering Research Center.
Allen K. Coleman.
Desalination, Vol. 9, No. 4, p 315-331, December, 1971. 5 fig, 4 tab, 13 ref.

Descriptors: \*Optimization, \*Mathematical studies, \*Dynamic programming, \*Desalination, Desalination processes, Flow, Distillation, Model

A dynamic programming model was developed to estimate the minimum cost design and operation of a single effect multi-stage flash distillation desalination system. The dynamic programming explicitly considered the effects of salinity changes upon specific heats and boiling point temperature rises and the coupling between the heat recovery and heat rejection sections of the system. The model was in a form such that feasible combinations of overall flow rates may be computed first. From the calculated flow rates, dynamic programming was shown to be useful for estimating the system's parameters that minimized the total cost. (Ligon-Cornell)
W72-05324

## WATER TRANSPORT IN HYPERFILTRATION

MEMBRANES, Weizmann Inst. of Science Rehovoth (Israel).

D. Vofsi, and O. Kedem.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$0.70. Office of Saline Water Research and Development Progress Report No 401, March 1969. 73 p, 18 fig, 14 tab, 7 ref. 14-01-0001-961.

Descriptors: \*Reverse osmosis, \*Membranes, \*Separation techniques, Osmosis, Mass transfer, Permselective membranes, Semipermeable membranes, Pressure, Ions, Hydrogen, Desalination. Identifiers: \*Hyperfiltration, Crosslinked albumin, Collodion matrix.

A loose charged membrane was prepared by cross-A flower transport in this membrane gives negative flow is obtained at relatively low pressures. Hyperfiltration of sulphuric acid and of hydrochloric acid in this membrane gives negative rejection (enrichment) in the concentration range from 0.001N to 0.1N; the negative rejection is higher and is observed in a wider range for sulphuric acid. Mixtures of copper sulphate and sulphuric acid and of copper chloride and hydrochloric acid were hyperfiltrated. Positive rejection of copper ions and negative rejection of hydrogen ions were

obtained in these mixtures. Thus, a considerable separation was achieved. (OSW abstract) W72-05445

#### MECHANISM OF ELECTRODE DEMINERALIZATION, Rocketdyne, Canoga Park, Calif.

S. Evans

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$0.50. Office of Saline Water Research and Development Progress Report No 156, February 1966. 88 p, 22 fig, 26 tab, 15 ref. 14-01-0001-334

Descriptors: \*Desalination, \*Electrodes, \*Electrochemistry, Ion exchange, Adsorption, \*Demineralization, Ions, Carbon, Cation exchange. Identifiers: \*Coulometry.

Voltammetry at linearly changing potentials was utilized in the determination of the double-layer capacity of carbon-type materials used in demineralization. Extensive coulometric and mass-balance experiments were conducted with cation-responsive paste electrodes. The mechanism of ion uptake and release at such elec-trodes is presented. The exchange characteristics (rate, efficiency, and capacity) of these materials were evaluated. Cations are removed from solu-tion by the application of a cathodic current to cation-responsive paste electrodes. Cation exchange takes place at weak-acid groups present on the carbon surface. The acid groups are ionized during the cathodic cycle by the electrochemical generation of hydroxyl ion. Hydrogen is not evolved. Iogenic groups thus produced result in depletion of cations from solution by an ion-exchange process. During regeneration, the hydrogen which was ad-sorbed during the cathodic cycle is oxidized giving rise to acid conditions. The iogenic groups are thus converted into the undissociated acid form and cations are relased to the solution. Demineralization and regeneration occurred efficiently at ionexchange resin electrodes in accordance with the mechanism presented. (OSW abstract) W72-05446

# DEMINERALIZATION OF SALINE WATER BY ENVIRONMENTALLY MODULATED ADSORP-

Marquardt Corp., Van Nuys, Calif.

A. M. Johnson.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$0.30. Office of Saline Water Research and Development Progress Report No 155, February 1966. 42 p, 5 tab, 12 fig, 21 ref.

Descriptors: \*Desalination, \*Ion exchange, \*Ions, \*Adsorption, \*Electrochemistry, \*Demineralization, Ion transport, Carbon, Electrodes, Cation adsorption. Identifiers: \*Sirotherm Process.

Electrochemical adsorption processes for desalt-ing water were studied considering reversible adsorption which can be modulated by changes in the temperature, pressure, and/or concentration of saline species in the adsorption system. The magnitudes of these effects, which include both elec-trochemical and ion exchange processes, and their suitability for use in simple, low-cost systems have been investigated. A thermally modulated system making use of suitably pretreated granular carbon adsorbents seems to be especially attractive. The technical feasibility of such a process has been demonstrated and the useable salt exchange capacity has been found to be sufficient for practical use with respect to energy consumption and to initial cost. Proof of practical feasibility will be dependent upon the expected further development of the process and especially upon demonstration of sufficient durability of adsorbents. (OSW abstract) W72-05447

#### Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

#### Group 3A—Saline Water Conversion

REVERSE OSMOSIS MEMBRANE RESEARCH, Gulf General Atomic, Inc., San Diego, Calif. U. Merten, H. K. Lonsdale, R. L. Riley, and K. D. Vos.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$1.00. Office of Saline Water Research and Development Progress Report No 369, November 1968. 104 p, 26 tab, 23 fig, 47 ref.

Descriptors: \*Reverse osmosis, \*Membranes, \*Semipermeable membranes, \*Desalination, Permselective membranes, Separation techniques, Pressure, Ion exchange, Cellulose, Surfactants,

Identifiers: \*Cellulose acetate, Polyvinylpyrrolidone, Diisocyanates, Polymer latices, Protein

The objectives were to improve the properties and performance of existing modified cellulose acetate (CA) membranes and to search for improved membrane materials. Studies of (CA) membranes were concerned mainly with the compaction phenomenon, membrane life, and methods for drying modified membranes. In the area of mem-brane compaction, the use of finely divided filler particles in an attempt to improve resistance to creep was studied. The effect of temperature and salt concentration on compaction rates was examined. A rapid method for assessing compaction rates was devised, and several membrane-life experiments were completed. One of these was made at pH10, where the hydrolysis of (CA) is rapid and the deterioration of modified membranes can be observed in a short-term test. The effects of long-term storage of membranes on their performance and the use of a variety of preservative solutions were examined. A method was developed for dry-ing the modified (CA) membranes with no degradation in their performance. The method involves the use of surfactants to reduce the surface tension of the water in the membrane pores. Surfactants were useful and the conditions for their successful application was defined. Research on new membrane materials was concerned with polyvinylpyrrolidone (PVP) systems. Water-solu-ble PVP can be insolubilized by reacting with any of several diisocyanate compounds. The diiso-cyanate-PVP compounds are normally totally insoluble gels. Membranes can be cast as the reaction proceeds, and the transport properties of such membranes were comparable to those of cellulose 2.5-acetate. Stable solutions of PVP and diisocyanates can be prepared by using 'blocked' diso-cyanates. The reaction is then effected after the membrane is cast by thermally unblocking the dis-socyanate. Direct osmosis and reverse osmosis measurements have yielded the same values for salt permeability, indicating that these membranes are generally free of imperfections. (OSW ab-

DEVELOPMENT REPORT NO. 9 - V.T.E. PROCESS DEVELOPMENT - FREEPORT TEST FACILITY - FREEPORT, TEXAS, Steams-Roger Mfg. Co., Denver, Colo. K. S. Campbell, and D. L. Williams.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$2.00. Office of Saline Water Research and Development Progress Report No 739, October 1971. 181 p, 21 fig, 51 tab. OSW Contract No. 14-01-001-1804.

Descriptors: \*Long-tube vertical distillation, Saline water, Distillation, Boiling, Deaeration, Heat exchangers, Heat transfer, Flow, Centrifugal pumps, Evaporators, \*Desalination, \*Sea water, Desalination plants, \*Materials testing, Conden-

Identifiers: Process development, Falling-film evaporation.

Major importance was placed on evaluating the double-fluted tube bundle and the titanium tube bundle to see how well they perform with time in a large desalination plant. Condensate handling-restrictions in the 5 effect module were studied. A major sump to sump brine transfer system modifi-cation was designed, installed and tested. An attempt was made to improve brine distribution by the use of porcelain spray nozzles in two effects. Enhanced surface spirally grooved tubes were evaluated both in a brine preheater and in the high temperature auxiliary test unit. Deaerator control at Run 14 optimum conditions and minimum acid addition rate were closely monitored. A full sized system of oxygen scavenging was operated, modified and evaluated. (OSW abstract)

ULTRATHIN MEMBRANES FOR REVERSE OS-MOSIS WATER DESALINATION,

North Star Research and Development Inst., Min-

neapolis, Minn.
L. T. Rozelle, J. E. Cadotte, and B. R. Nelson. For sale by the Superintendent of Documents, U. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$0.40. Office of Saline Water Research and Development Progress Report No 725, December 1971. 27 p, 7 fig, 5 tab, 2 ref. Contract No. 14-01-0001-1696.

Descriptors: \*Reverse osmosis, \*Membranes, \*Semipermeable membranes, Osmosis, Desalination, Saline water, Separation techniques, Membrane processes, Water purification.

Identifiers: \*Ultrathin membranes, \*Polysulfone

Two tubular modules (American Standard TM 5-8) containing ultrathin cellulose acetate membranes supported on microporous polysulfone films underwent a reverse osmosis test sequence to determine their suitability for water purification in U.S. Army field operations. The test consisted of three reverse osmosis runs of 100 hours each, with 0.5 percent NaCl at 600 psi. After each run, the modules were drained and held for at least 50 hours in a chamber maintained at 120 deg F or greater, and at less than five-percent relative humidity. Module A exhibited first, second, and third-service cycle water fluxes of 26.5, 17.9, and 15.7 gfd, respectively. Module B exhibited fluxes of 25.0, 16.7, and 13.7 gfd, respectively. The salt rejections were over 94 percent for both modules. The decline in the water flux of the two modules between service cycles was attributed to the hydrophobicity of the polysulfone support after being exposed to the severe dry conditions of the drying cycle. The incorporation of hydrophilic additives into the polysulfone support to help offset this hydrophobicity appeared to be successful. (OSW abstract) W72-05450

DISTILLATION-CONDENSER WITH VERTI-CALLY DISALIGNED TUBES,

Saline Water Conversion Corp., Oradell, N.J. (Assignee).

Ralph C. Roe. U.S. Patent No. 3,501,382, Patent Abstracts Section, Official Gazette, Vol 872, No 3, p 925, March 17, 1970. 4 p, 7 fig, 13 ref.

Descriptors: \*Patents, \*Vapor compression distillation, Flash distillation, \*Desalination, Evaporation, Condensation, Separation techniques, Water purification, Freshwater, Steam, \*Distillation. Identifiers: Freshwater recovery.

A novel surface condenser arrangement recovers fresh water from steam, or recovers fresh water from saline or otherwise contaminated solutions. In a surface condenser unit condenser tubes extend horizontally and are arranged in vertical disalignment so that no condenser tube extends directly above another tube. The condensate drops directly down and avoids all further contact with the tubes. The condenser tubes are maintained at maximum heat transfer effectiveness. (Sinha-W72-05455

DISTILLATION PLANT, Department of the Interior, Washington, D.C. (As-

U. S. Patent No. 3,499,827, 5 p, 7 fig, 14 ref; Patent Abstracts Section, Official Gazette, Vol. 872, No. 2, p 520, March 10, 1970.

Descriptors: \*Patents, \*Desalination plants, \*Distillation, \*Condensation, Liquids, Separation techniques, Sea water, \*Treatment facilities, water treatment.

The plant consists of a vertical stack of 'effects' each having horizontal vapor tubes. A perforated pan distributes feed water over the tubes. Another pan collects unevaporated liquid. The feed liquid flows by gravity from one area to the next. The condensate is collected and constitutes the end product, i.e. fresh water in the case of a desalting plant. (Sinha-OEIS) W72-05468

DESALINATION APPARATUS AND PROCESS, McDonnell Douglas Corp., Santa Monica, Calif. (Assignee). Fred E. Littman.

Descriptors: \*Patents, \*Desalination apparatus, \*Desalination processes, \*Reverse osmosis, \*Membranes, Separation techniques, Seawater, Brackish water, Waste water treatment. Identifiers: Glass membranes, \*Capillary mem-

Porous glass elongate capillary membranes are set out parallel within a fluid tight pressure chamber. The feed solution is applied under pressure to the outer surfaces of the capillary tubes, forcing the solution through the porous glass wall of the tubes. The solution reduced in salt content is withdrawn from the capillary membranes or tubes as product. (Sinha-OEIS) W72-05511

APPARATUS AND PROCESS FOR THE CON-TROLLED OSMOTIC SEPARATION WATER FROM SEA WATER. Morris Mendelson.

U.S. Patent No 3,498,910, Patent Abstracts Section, Official Gazette, Vol 872, No 1, p 269, March 3, 1970. 4 p, 1 fig, 2 ref.

Descriptors: \*Patents, \*Desalination apparatus, \*Reverse osmosis, Separation techniques, \*Desalination processes, \*Membranes, Sea water, Brackish water, Osmosis, Waste water treatment.

A reverse-osmosis permeability cell is connected with primary and secondary feed circuits. The primary circuit supplies the cell with sea water. The secondary circuit is periodically connected with the primary circuit to replenish the temporary storage chamber and to wash the permeability membrane of accumulated salts. As the capacity of the membrane to separate fresh water is reduced, the sea water flow rate through the cell is increased so that the fresh water output remains at a fairly constant level. (Sinha-OEIS)

LOW PRESSURE DEGASSING OF FEED WATER IN MULTI-STATE FLASH EVAPORA-

Applied Research and Engineering Ltd., Durham (England) (Assignee).

(England) (Assignee). Roy Starner. U.S. Patent No. 3,501,384, Patent Abstracts Section, Official Gazette, Vol 872, No 3, p 926, March 17, 1970. 2 p, 5 fig, 9 ref.

Descriptors: \*Patents, \*Desalination apparatus, \*Evaporators, \*Flash distillation, Separation \*Evaporators, \*Flash distillation, Separation techniques, Sea water, Brackish water, \*Distilla-tion, Waste water treatment.

Identifiers: Multi-stage flash evaporation, Degassers, \*Flash evaporators.

#### WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

#### Saline Water Conversion—Group 3A

Heated water is passed through a succession of flash chambers. Make-up feed water is mixed with at least some of the water remaining in one of the cooler stages and the water mixture is fed in contra flow heat exchange relation with vapor from water passing through the flash chambers. Heating takes place before the feed water passes through the degasser. Pressure in the degasser is kept lower than in the evaporator. (Sinha-OEIS) W72-05513

#### FLASH DISTILLATION PARTITIONED

TOWER, Weir Westgarth Ltd., Glasgow (Scotland) (As-

signee). Peter Thomas Walker, and Ivan Henry Newson. U.S. Patent No. 3,498,886, Patent Abstracts Sec-tion, Official Gazette, Vol 872, No 1, p 264, March 3, 1970. 2 p, 2 fig, 9 ref.

\*Patents, \*Flash distillation. Descriptors: \*Desalination, Condensation, Brine, Sea water, Separation techniques, \*Distillation, Waste water

The first step consists of heating raw feed liquid, then passing it into the lower portion of an undivided vertical section of a tower. Pressure is maintained to form a mixture of vapor and liquid. The liquid is withdrawn and condensation of the vapor takes place. After it leaves the tower, the condensate may be passed to an oil/water separator and the fresh water recovered. (Sinha-OEIS)

# AN INTEGRAL APPROACH TO URBAN WATER SUPPLY SYSTEMS, Kaiser Industries Corp., Oakland, Calif. For primary bibliographic entry see Field 06B.

## SECOND REPORT ON HORIZONTAL-TUBES

MULTIPLE-EFFECT PROCESS PILOT PLANT TESTS AND DESIGN, Universal Desalting Corp., New York. R. B. Cox, G. A. Matta, A. S. Pascale, and K. G.

K. B. Cox, G. A. Matta, A. S. Pascale, and K. G. Stromberg.
Copy available from GPO Sup Doc \$1.50. Office of Saline Water Research and Development Progress Report No 592, May 7, 1970. 128 p, 20 fig, 127 tab, 3 ref. Contract No. 14-01-0001-2247.

Descriptors: \*Design criteria, \*Dropwise condensation, Heat transfer, \*Desalination, Films, Evaporators, Condensers, Boiling, Distillation, Pilot plants.

Identifiers: \*Horizontal tube evaporators, \*Multiple effect distillation.

A single-effect test unit at the OSW Wrightsville Beach Plant is described in OSW R and D Progress Rept. No. 492 has been automated for continuous operation. Data obtained during previous short-du-ration tests were confirmed by continuous operation and by a specific 500-hr. run. The factors that influence the overall heat transfer coefficient were further delineated. The effect of various surface enhancements on the heat transfer coefficient was determined and coefficients 2 to 3 times those in LTV smooth tubes were obtained. A 3-effect test unit was designed to determine the parameters as-sociated with inter-effect operation and to demonstrate the adequacy of designs for larger sized plants. This 3-effect test unit is described together with a discussion of the operating parameters and design innovations to be demonstrated in future tests. (OSW abstract) W72-05676

# IMPROVED RESINS FOR THE REMOVAL OF BORON FROM SALINE WATER--EXPLORATORY STUDY,

Dow Chemical Co., Walnut Creek, Calif. R. R. Grinstead, and R. M. Wheaton. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price \$0.65. Office of Saline Water Research and Development Progress Report No 721, December 1971. 65 p, 16 fig, 13 tab, 25 ref. Contract No 14-30-2617

Descriptors: \*Boron, \*Ion exchange, Saline water, Irrigation water, Desalination, Return flow, Resins, Ions, Water treatment, Water supply. Identifiers: Water beneficiation,

The following major aspects were studied of the boron removal problem: (1) the development of resins without basic amino groups, (2) the develop-ment of cheaper resin materials, and (3) the development of resins which could handle high feed flow rates. The boron-selective resins prepared by the reaction of N-methyl glucamine (NMG) with a chloromethylated crosslinked polystyrene matrix, as exemplified by Amberlite EE-243, were very effective for boron removal. Column performance can be improved and process costs can be reduced by use of a somewhat finer mesh resin than the present-16+50 mesh material. No other amino polyol derivative was found equal to that prepared from NMG and the macroporous copolymer. Though there has been no attempt to calculate resin costs, no product having obviously lower costs has been revealed. The cost of removal of 10 ppm B from water will approximate 21 cents/M gallons at one million GPD production, about 12 cents/M gallons at 10 million GPD. The costs of course would be lower for lesser levels of boron reduction. These cost estimates do not include ultimate disposal of the regenerant stream, including boron. (OSW abstract) W72-05677

#### VAPOR COMPRESSION DISTILLATION SECONDARY HEAT TRANSFER MEDIA,

Ferguson (H. K.) Co., New York,

J. C. Chambers

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price \$2.25. Office of Saline Water Research and Development Progress Report No 122, January 1966. 308 p, 6 fig, 9 tab, 12 ref. 14-01-0001-280.

Descriptors: Desalination, \*Vapor compression distillation, Distillation, \*Desalination processes, Heat transfer, Pilot plants, Evaluation,

Economic and process data are presented for a 50,000-GPD pilot plant and for 1- and 10-Mgd plants. A 58,000-GPD pilot plant would require an investment of \$313.810 and produce water at \$2.45/1000 gal. A 10-Mgd plant with aluminum bronze heat transfer surfaces operating at a maximum of 175 deg F would require \$13,673,000 and produce water at 85.5 cents/1000 gal. If operating at 270 deg F is possible, the investment should be about \$7,500,000 and produce 60 cents/1000 gal. For a 1-Mgd plant, extending the maximum temperature from 180 to 300 deg F results in 25 cents reduction in the cost of water from \$1.10 to 84.7 cents/1000 gal. A large plant should be driven by steam to take advantage of the exhaust heat availa-ble after extraction of power. However, for the simplicity of operations and lower capital costs, it is recommended that a 10 to 12 effect all-electric pilot plant be installed to fully test the process. (OSW abstract) 72-05678

#### INORGANIC SEMIPERMEABLE MEM.

BRANES, Baylor Univ., Waco, Tex. W. O. Milligan, M. Uda, R. Dillin, E. W. Bailey, and R. J. Williams.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$0.30. Office of Saline Water Research and Development Progress Report No. 723, October 1971, 16 p. 2 fig. 1 tab, 26 ref. Grant No. 14-01-0001-1296.

Descriptors: "Semipermeable membranes, "Membrane processes, Membranes, Dialysis, Osmosis, Desalination, Crystallography, X-ray diffraction. Identifiers: Inorganic membranes, Cyanide mem-

The precipitated heavy-metal ferro, ferri, and cobalti cyanides are semipermeable inorganic membranes and represent a class of which cupric ferrocyanide (the classical inorganic semipermea-ble membrane) is a typical example. The freshly one memorane) is a typical example. The freship precipitated gels are composed of 10A primary particles which are 'amorphous' or extremely poorly crystalline, and which age in contact with water to form larger crystals, usually still within the colloidal range of size. Cupric ferrocyanide ages under water to form very thin sheet-like crystals which ashbit very very differential. crystals which exhibit extra x-ray diffraction lines, and yield a step-wise dehydration isobar. Other complex cyanides, such as Co3 (Fe (CN)6)2, Ni3 (Co (CN)6)2, and Co3 (Co (CN)6)2, and others, may also exhibit additional x-ray diffraction lines on aging, but the sheet-like morphology is very less noticable or is non-existent. The cyanide complexes of the lanthanides and other cations with a crystal radius larger than 1 A, tend to form a second isomorphous series that is hexagonal rather than cubic. The crystal structure of LaFe (CN)6.5H2O has been determined from three districtions of the crystal structure of the control of the crystal structure of the control of the con dimensional, single crystal, x-ray diffraction data. X-ray powder photographs show that this material is a member of an isomorphous series of com-pounds which include the ferrocyanide of Th+4 and the ferro and ferri cyanides of Y+3, Bi+3 and 13 of the trivalent lanthanide metal ions. (OSW abstract) W72-05679

#### FOURTH ANNUAL REPORT VAPOR COM-PRESSION TEST BED PLANT ROSWELL, NEW MEXICO.

Westinghouse Electric Corp., Orange, Calif.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$1.50. Office of Saline Water Research and Development Progress Report No. 362, July 1968, 168 p, 52 fig. 14-01-0001-952.

Descriptors: Brackish water, Long-tube vertical distillation, Distillation, Boiling, Deaeration, Heat exchangers, Heat transfer, Flow, Centrifugal pumps, Evaporators, Condensers, Desalination processes, Maintenance, Operations, Vapor comprocesses, Maintenance, Operations, Vapor compositions, Condensers, C pression distillation, Testing

The vapor compression process is used as the energy source to a double-effect forced-circulation evaporator for the conversion of brackish water. This report presents the results obtained from operation, maintenance and development studies during fiscal year 1967. (See a'o 00614) W72-05688

## DEVELOPMENT OF PROPANE HYDRATE DESALTING PROCESS.

Sweet Water Development Co., Dallas, Tex. V. C. Williams, C. L. Roy, H. Smith, Jr., and O. B. Battle.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$1.50. Office of Saline Water, Research and Development Progress Report No. 373, August 1968, 103 p, 21 fig, 6 tab, 5 ref. 14-01-0001-341, 14-01-0001-1238.

Descriptors: \*Desalination, \*Hydrate processes, Pilot plants, Potable water, Separation technique, Identifiers: Cyclone separation, Wash column.

A 20,000-gpd pilot plant was designed and con-structed at Wrightsville Beach, North Carolina. Operations began in March 1965. The major problem in obtaining potable water from the pilot plant was that of wash-separation. Cyclones were used but were unsuccessful. A pressurized wash

#### Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

#### Group 3A—Saline Water Conversion

column was then used for wash-separation. Although the tests on this column indicated that such a method may work, no potable water was obtained. The work was then discontinued. (OSW abstract)
W72-05694

OPTIMIZATION OF STAINLESS STEELS FOR USE AS CONDENSER TUBES, Westinghouse Electric Corp., Pittsburgh, Pa.

Westinghouse Electric Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 08G. W72-05740

MSF PILOT PLANT TEST ON POLLUTED FEED WATER.

Geological Survey, Trenton, N.J.; and New Jersey State Dept. of Health, West Orange; and Aqua-Chem, Inc., Milwaukee, Wis.; and Powell (Sheppard T.) and Associates, Baltimore, Md.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$1.00. Office of Saline Water Research and Development Progress Report No 728, May 1971. 87 p., 14 fig, 7 tab, 11 ref. OSW Contract Nos. 14-00-0001-1446, -1684, -2591.

Descriptors: \*Desalination, \*Distillation, \*Pilot plants, New Jersey, \*Flash distillation, Waste water treatment, Brackish water, Potable water. Identifiers: \*Hackensack River, Jersey City (New Jersey).

The activities are discussed of the MSF skid-mounted pilot plant while in operation in Jersey City, New Jersey, using polluted, brackish feed water from the Hackensack River. The report is a summary of the individual activities of the participants in the study and are listed as the authors above. The unit was operated on the polluted feed water to determine if distillation could be used for producing potable water. Study showed that (1) potable water can be made but that carbon filtration post treatment is necessary to meet all aesthetic and health standards; (2) no unusual corrosion of equipment takes place, and (3) fouling is not a serious problem on this type water. (OSW abstract)

MEASUREMENTS OF CONCENTRATION POLARIZATION BOUNDARY LAYER IN REVERSE OSMOSIS DESALINATING SYSTEMS.

National Instrument Labs., Inc., Rockville, Md. H. Goldsmith, and H. Lolachi.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Price \$1.25. Office of Saline Water Research and Development Progress Report No. 727, December 1971. 120 p, 37 fig, 14 ref. Contract No. 14-01-0001-1799.

Descriptors: \*Boundary layers, \*Reverse osmosis, \*Membranes, \*Test procedures, \*Desalination, Testing.

Identifiers: \*Annular test cell, \*Concentration polarization buildup, \*Static test cell.

Concentration polarization in reverse osmosis desalinating systems affects the two most important objectives of the desalination, namely the quantity and the quality of the product water. The main results achieved were (a) the development of Ag-AgCl electrodes that respond to chloride ions in a Nernstian fashion and were found to be insensitive to pressure and velocity, (b) development of a test cell for simultaneous and direct measurements of concentration polarization at the surface of the membrane, product water salinity, product water flow rate and the membrane compaction in a one-dimensional reverse osmosis desalinating system, (c) study and direct measurement of concentration polarization boundary layer profile in a practical two-dimensional desalinating module. (OSW abstract)

STRUCTURE OF SEMIPERMEABLE POLYMER FILMS AND ITS EFFECT ON SALT REJECTION, Carnegie-Mellon Univ., Pittsburgh, Pa.

Carnegie-Mellon Univ., Pittsburgh, Pa. D. W. Tanner, G. C. Berry, J. Borch, and T. G.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Price \$1.25. Office of Saline Water Research and Development Progress Report No. 737, December 1971. 118 p, 41 fig, 85 ref. Contract No. 14-01-0001-1648.

Descriptors: \*Reverse osmosis, \*Cellulose, \*Xray diffraction, \*Desalination, Films, \*Membranes, \*Thermodynamics, Properties, Polymers. Identifiers: \*Light scattering, \*Cellulose acetate, \*Casting solutions, \*Fractionation gels.

The thermodynamics and conformational properties of cellulose acetate and other cellulose esters in dilute solution are reviewed. New data obtained on fractions of cellulose acetate (D.S. = 2.45) are described. These data include the temperature dependence of the second virial coefficient, the mean square radius of gyration and the intrinsic viscosity. The solubility of cellulose acetate in many solvents has been investigated, and refractometry and light scattering studies have been carried out in many of these. Cellulose acetate was strongly associated in dilute solution in most, if not all, of the solvents examined. The relevance of these results on dilute solutions to the film forming process is discussed. (OSW abstract)

# COUPLING OF SOLUTE FLOWS IN SYNTHETIC AND BIOLOGICAL MEMBRANES,

New England Medical Center Hospitals, Boston, Mass. A. Essig.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Price \$1.00. Office of Saline Water Research and Development Progress Report No. 752, January 1972. 110 p, 19 fig, 10 tab, 17 ref. OSW Grant No. 14-30-2516.

Descriptors: \*Biological membranes, \*Membranes, Permselective membranes, Semipermeable membranes, Saline water, Kinetics, Permeability, Diffusion, Thermodynamics, Desalination, Toads, Frogs.

Identifiers: \*Isotope flows, \*Coupling of solute flows, Sodium transport, Active transport, Oxygen consumption, Electrical potential.

Preliminary studies showed that it was possible to demonstrate linear relations between the rate of metabolism (oxygen consumption) Jr and the electrical potential difference delta psi in the toad bladder, as previously in the frog skin. However, because the toad bladders did not show as good long-term stability further studies of oxygen consumption were limited to the frog skin. A problem which occasionally interfered with studies in the frog skin was steadily increasing 'basal' oxygen consumption consequent to contamination by pseudomonas and other organisms resistant to penicillin and streptomycin. This has been successfully countered by the use of gentamycin. As indicated earlier, studies of the short circuit current Io and the slope dJr/d (delta psi) permit the calculation of the affinity A (negative free energy) of a metabolic oxidative reaction driving sodium transport. This approach has been used to analyze the mode of action of aldosterone, a physiologically important hormone which enhances salt conservation by the kidney. Paired tissues obtained from the same animal were compared initially (when both were untreated), and again 24 hours later (after one had been exposed to aldosterone). These results suggest strongly that aldosterone in-creases the free energy of the reaction driving transport. (OSW abstract) W72-05789

#### **DISTILLATION DIGEST VOLUMES 3 AND 4.**

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Price \$3.00. Office of Saline Water Research Development Progress Report No 731, October 1971. 432 p.

Descriptors: \*Desalination processes, \*Flash distillation, \*Long-tube vertical distillation, \*Tubes, \*Oxygen, \*Fouling, Flow, \*Interfaces, \*Evaporation, \*Scaling, Sulfates, \*Silicates, Analysis, Aluminum, Vortices. Identifiers: Desulfation, Desilication.

The quarterly Volumes 3 and 4 of the Distillation Digest, which were published in 1969-1970, have been consolidated into this one volume. The chapters relate to special reports, progress reports, or abstracted final reports on development work sponsored by the Office of Saline Water in either multistage flash or vertical tube evaporation of sea or brackish waters. Also, listed is the programs for the 1971 Feed Treatment Symposium and the Information Meeting on the multistage flash module operation at San Diego in 1970. (OSW abstract) W72-05790

# BENCH SCALE STUDY OF THE VACUUM FREEZING EJECTOR ABSORPTION PROCESS.

Colt Industries, Inc., Beloit, Wis. J. Koretchko, and G. Hajela.

For sale by the Supt. of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - Price \$3.50. Office of Saline Water Research and Development Progress Report No. 744, November 1971. 257 p, 50 fig. 14 tab. Contract 14-30-2679.

Descriptors: \*Desalination processes, \*Freezing, \*Laboratory tests, \*Saline water, Design, Absorption, Pilot plants.

Identifiers: \*Vacuum freezing, \*Ejector, \*Absorber.

The vacuum freezing ejector absorption process is similar to the vacuum freezing vapor compression process in the freezing, washing and melting operations. However, the mechanical compressor is replaced by an ejector absorption loop. Water vapor, or low pressure steam is recycled through the system to act as primary steam for the ejector. A 6,000-gpd equivalent bench-scale-size ejector was built and tested. The tests showed that the ejector was very stable and could be scaled-up to larger sizes. Also, a 6,000-gpd absorption system test loop was constructed and operated. NaOH was used as the absorbent. A mathematical study was made of the complete process. Also, a preliminary design of a 60,000-gpd pilot plant was made. (OSW abstract)

OPERATION OF THE MULTI-STAGE FLASH DISTILLATION PLANT, SAN DIEGO, CALIFORNIA - THIRD REPORT (SEMI-A-NNUAL).

Catalytic Construction Co., Philadelphia, Pa.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 - 658. Office of Saline Water Research and Development Progress Report No. 705, August 1971. 554 p., 107 fig, 27 tab, 13 ref. OSW Contract 14-30-2652.

Descriptors: \*Operations and maintenance, \*Management, \*Flash distillation, \*Desalination, Heat exchangers, Pumps, Corrosion, Water treatment, Deaeration, Evaporators, Operating costs, Design, Scaling, Desalination apparatus.

The management, operation, maintenance, physical plant, and information gained in the overall program of advancing the state-of-the-art of desalting technology are discussed. The plant is a 2,500,000-gallon per day full size module of a

### Conservation in Industry—Group 3E

50,000,000-gallon per day multi-stage flash sea-water desalination plant. The module is operated in conjunction with a utility electric power plant. The plant is designed to provide meaningful data concerning the design and operation of large desalination plants including such items as heat uchammatum plants including such items as heat transfer, equipment and structural design, materi-als, cost of providing fresh water, process en-gineering, operation of multi purpose plants, and equipment performance. (OSW abstract) W72-05792

### 3B. Water Yield Improvement

LIQUID STORAGE,

Phillips Petroleum Co., Bartlesville, Okla. (Assignee).

U.S. Patent No. 3,501,917, 2 p, 2 fig, 4 ref; Patent Abstracts Section, Official Gazette, Vol. 872, No. 4, p. 1092, March 24, 1970.

Descriptors: \*Patents, Reservoirs, Reservoir storage, \*Evaporation control, Reservoir design,
\*Arid lands, Conservation, \*Water storage, Water
loss, Water conservation, \*Water yield improve-

Identifiers: Evaporation loss.

A low cost system is described for storing surface water in windy, arid regions. A reservoir formed in the earth is provided with a cover formed of relatively thin, flexible material to prevent water loss by evaporation. To protect the cover from destruction by wind, the interior of the reservoir is either evacuated or pressurized. (Sinha-OEIS) W72-05430

## WEATHER MODIFICATION IN WATERSHED

MANAGEMENT, Fresno State Coll. Foundation, Calif. Atmospheric Water Resources Research.

M C Williams

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No 1R4, Paper 8608, p 585-600, December 1971. 6 fig, 2 tab, 16 ref. USBR Contracts 14-06-D-5819 and 14-06-D-6502.

Descriptors: \*Weather modification, \*Water management (Applied), Water yield improvement, Cloud seeding, California.

Water resource developments in California involve a wide range of activities designed to meet increased needs. These activities include both research and waterproducing weather modifica-tion activities designed to supplement natural sup-plies. Over a significant period of time, 5% to 10% increases in average annual runoff can be achieved. Increases of 20% to 50% can be achieved in the future. An example of the significance of such increases can be seen from the watershed management practices for the Kings River which is typical of the San Joaquin Valley of California. (Knapp-USGS) W72-05489

### EVAPOTRANSPIRATION REDUCTION,

Meteorological Office, Poona (India). M. Gangopadhyaya, and S. Venkatoraman Agricultural Meteorology, Vol 6, 1969, p 339-345. 2 fig, 1 tab, 4 ref.

Descriptors: \*Evapotranspiration, \*Transpiration control, \*Soil water movement, \*Monomolecular films, \*Water yield improvement, Stomata, Water loss, Plants, Irrigation, Evaporation control. Identifiers: OED green, Phenyl mercuric acetate.

Field problems involved in the chemical reduction of evapotranspiration losses were investigated. Initial mixing of the top layer of the soil with OED green (a water emulsion of alkoxy ethanol) gave economically worthwhile reductions in evaporation from a freely drained periodically irrigated soil surface. Spraying of OED green initially on a wet soil surface appeared promising. Trials on paddy showed that monomolecular films of paddy showed that monomolecular films of petroleum ether did not have any harmful contact effects on the crop; the effect of phenyl mercuric acetate on young plants disappeared with the emergence of a fresh flush of foliage and a com-bination of phenyl mercuric acetate and OED green was more effective but toxic. (Skogerboe-Colorado State)

VAPOR LOSSES THROUGH SOIL MULCH AT DIFFERENT WIND VELOCITIES,

Punjab Agricultural Univ., Hissar (India). Dept. of

C. L. Acharya, and S. S. Prihar. Agronomy Journal, Vol 61, No 5, September-October, 1969, p 666-668. 3 fig, 3 tab, 6 ref.

Descriptors: \*Soil moisture, \*Mulching, \*Evaporation control, \*Wind velocity, Water Descriptors: vapor, Surfactants, Evaporation. Identifiers: Mulch porosity, Mulch thickness.

Rates of water vapor loss, E, through surfactant treated soil mulch of varying porosity and thickness were measured in pots exposed to vari-ous wind velocities under a wide range of evapora-tive demand. Empirical values of constant 'BD' ous wind velocines under a wide range of evapora-tive demand. Empirical values of constant 'BD' obtained from the relation Eo/E = 1+BDZn (where Eo is the potential evaporation from the medium and Zn is the thickness of mulch) were ex-pressed in terms of wind velocity (X1) and porosipressed in terms of wind velocity (XI) and porosity of mulch (X2). Multiple regression of the type BD = q + q1X1 + q2X2 was used to express BD as a function of wind velocity and porosity of mulch within the range of linearity of the relation Eo/E = f(Zn). (Skogerboe-Colorado State) W72-05705

WATER AVAILABILITY OF MARENGO COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala.

For primary bibliographic entry see Field 07C. W72-05842

WATER AVAILABILITY OF CLARKE COUN-TY, ALABAMA,

Geological Survey, Tuscaloosa, Ala. For primary bibliographic entry see Field 07C. W72-05843

### 3D. Conservation in Domestic and Municipal Use

FEASIBILITY OF THE METROPOLITAN WATER INTELLIGENCE SYSTEM, (INTEGRATED AUTOMATIC OPERATIONAL CONTROL),

American Society of Civil Engineers, New York, For primary bibliographic entry see Field 04A. W72-05328

AND THE ECONOMIC RESOURCES FRAMEWORK, For primary bibliographic entry see Field 06B. W72-05563

AN INTEGRAL APPROACH TO URBAN WATER SUPPLY SYSTEMS, Kaiser Industries Corp., Oakland, Calif. For primary bibliographic entry see Field 06B. W72-05565

STEAM CLEANED WATER, Office of the Chief of Engineers (Army), Washington, D.C.

W.J. Papin. Water Spectrum, Vol 3, No 4, p 37-39, Winter 1971-72. 2 photo.

Descriptors: \*Thermal water, \*Thermal power, \*Steam, \*Water pollution, \*Water quality, \*Water supply, \*Management, Water treatment, Air pollu-tion, Feasibility studies, Electric power, Salts, Sea

water, Environment.
Identifiers: \*Steam cleaned water, \*Iceland, \*Geothermal resources, Experiments, Steam jets,

Steam power.

In Iceland water resource management is unen-cumbered by water quantity and quality issues. Today, three-fourths of the homes and businesses of Reykjavik, Iceland are heated by natural hot water. The main geothermal resource is located at water: The main geothermar resource is located at Reykir, eighteen kilometers from Raykjavik. A pumping station and a main supply line at Raykir bring the water, at 1540 F, to Reykjavik, where the water is stored in eight tanks which hold over two million gallons and function as flow equalizers. The water is completely potable without any treat-ment. Since the system is one provided by nature the air in Raykjavik remains unpolluted. Exotic tropical fruits and plants are grown as part of the Icelandic governments' experimental program. Experiments are being conducted to determine the feasibility of harnessing the natural steam jets for the production of electric power. Studies are also being made to see if natural steam power can be used to extract salt from sea water or possibly other minerals as well. (Strachan-Chicago) W72-05576

THE MERRIMACK TAPES, Corps of Engineers, New York. North Atlantic

For primary bibliographic entry see Field 05D.

POPULATION CONTROL: ULTIMATE NECES-SITY IN WATER RESOURCE MANAGEMENT, Heller, Ehrman, White and McAuliffe, San Fran-

For primary bibliographic entry see Field 06B. W72-05580

PORT GROWTH POLICIES ABROAD. Little (Arthur D.), Inc., Cambridge, Mass For primary bibliographic entry see Field 06B. W72-05581

SUMMARY OF THE HYDROLOGIC SITUA-TION ON LONG ISLAND, NEW YORK, AS A GUIDE TO WATER-MANAGEMENT ALTER-

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W72-05658

LAND USE CONFLICT AND PUBLIC POLICY, California Univ., Davis. Dept. of Economics. For primary bibliographic entry see Field 06B. W72-05674

MODELS IN URBAN PLANNING: A SYNOPTIC REVIEW OF RECENT LITERATURE, Centre for Environmental Studies, London (En-

gland). For primary bibliographic entry see Field 06B. W72-05692

THE POLITICS OF WATER SUPPLY IN NORTHERN NEW JERSEY, Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst. For primary bibliographic entry see Field 06E. W72-05871

### 3E. Conservation in Industry

UNIT PRICING CHALLENGES TRADITIONAL BLOCK-RATE METHOD, Delaware Univ., Newark. Urban Affairs Div.

### Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

### Group 3E—Conservation in Industry

For primary bibliographic entry see Field 06C. W72-05664

### 3F. Conservation in Agriculture

AN IMPROVED METHOD OF SOIL MOISTURE CONTROL WITH OBSERVATIONS ON TO-MATO GROWTH AND WATER UPTAKE, Kenana Research Station, Abu Naama (Sudan). For primary bibliographic entry see Field 02G.

(+)-ABSCISIC ACID CONTENT OF SPINACH IN RELATION TO PHOTOPERIOD AND WATER STRESS,

Michigan State Univ., East Lansing. Jan A. D. Zeevaart.

Plant Physiol. 48 (1): 86-90. 1971. Illus.

Identifiers: Abscistic-Acid, Amo-1618, Coleoptile, Dispersion, Flower, Formation, Gibberellin, Growth, Light, Optical, Photoperiod, Relation, Rotatory, Spinach-D, Spinacia-Oleracea-D, Stem, Stress, Wheat-M, Wilting.

Levels of (+)-abscisic acid present in the long-day plant spinach (Spinacia olearacea L. cv. Savoy Hybrid 612) grown under different photoperiodic regimes were measured in purified extracts by op-tical rotatory dispersion. When plants were transferred from short to long days, the abscisic acid content increased 2- to 3-fold. This rise in the level of abscisic acid took place during the 1st long day. Abscisic acid levels of plants under short days as well as under long-day conditions were higher at the end of the 8-hr high intensity light period than at its beginning. The growth retardant AMO-1618 (2'-isopropyl-4'- (trimethylammonium chloride)-5'-methylphenyl piperidine-1-carboxylate), which strongly reduces the gibberellin content of spinach under long days, did not affect the abscisic acid content. When water was withheld from plants until wilting symptoms appeared, the abscisic acid content increased more than 10-fold over that of turgid plants. There was no evidence that the sudden rise of abscisic acid level during wilting was due to release from a water-soluble bound form. Bioassays of crude acidic extracts in the wheat coleoptile section test did not indicate the presence of other specific growth inhibitors besides abscisic acid. It is concluded that abscisic acid does not function as an endogenous regulator of stem growth and flower formation in the longday plant spinach .-- Copyright 1971, Biological Abstracts. Inc W72-05364

PICLORAM PERSISTENCE IN SEMIARID RANGELAND SOILS AND WATER, Texas A and M Univ., College Station For primary bibliographic entry see Field 05B. W72-05368

DISSIPATION OF PICLORAM FROM VEGETA-TION OF SEMIARID RANGELANDS, Texas A and M Univ., College Station. Dept. of Range Science.

For primary bibliographic entry see Field 05B. W72-05371

DISSIPATION OF DICAMBA, PICLORAM, AND 2,3,6-TBA ACROSS NEBRASKA, Nebraska Univ., Lincoln. Dept. of Agronomy. For primary bibliographic entry see Field 05B.

SOME WATER AND PHYSICAL PROPERTIES OF THE PRINCIPAL TYPES AND SUBTYPES OF IRRIGATED SOILS IN THE SEVAN BASIN, For primary bibliographic entry see Field 02G. W72-05374

HYDROPHYSICAL PROPERTIES OF SOILS IN THE KZYL-ORDA IRRIGATED MASSII For primary bibliographic entry see Field 02G. W72-05375

GENESIS AND RATIONAL UTILIZATION OF SOILS (KAZAN UNIVERSITY). For primary bibliographic entry see Field 02G.

SOILS OF PADDY FIELDS. COLLECTION OF PAPERS BASED ON THE PROGRAM DRAWN UP BY THE NINTH INTERNATIONAL CON-GRESS OF PEDOLOGISTS.

Nauka: Alma-Ata. 1969. 103 p. Illus. Pr. 76 kopecks.

Identifiers: Book, Collection, Congress, Drawn, Fields, Formation, International, Microorganisms, Paddy-M, Papers, Pedologists, Physicochemical, Program, Redox, Rice-M, Soils, USSR.

Formation conditions and certain physicochemical and biological properties of soils in the 3 main ricegrowing areas in the USSR (Far East, Central Asia and southern Kazakhstan) and in tropical countries are described. Soils in the lower reaches of the Kuban, Volga, Syr Darya, Amu Darya and modification of their properties in flooded paddy fields are included. Data on redox conditions and microorganisms in waterlogged soils, solubility of phosphates in relation to activity of microorganisms, and the use of mineralized waters for the flushing of soil and the cultivation of rice are presented.--Copyright 1971, Biological Abstracts, Inc.

EFFECT OF SOIL FUMIGATION AND 6 SOIL WATER REGIMES ON MINERAL CONTENT

OF CARROTS, Department of Agriculture, Agassiz (British Columbia). Research Station. A. R. Maurer, and M. K. John

Can J Plant Sci. 51 (4): 275-281. 1971. Identifiers: Carrots-D, Fumigation, Mineral, Regimes, Soil.

Foliage of plants grown in fumigated soil had greater levels of P, Ca, Mn, Fe and Zn but lower levels of N and Al, while roots had greater levels of P, Na, Mn, Zn, Cu and Pb and a lower level of N in fumigated than in nonfumigated soil. Plants provided with ample soil water tended to have higher levels of P in roots and in foliage than plants grown under a dry regime. Cu and Pb levels in foliage were affected in the opposite manner.--Copyright 1971, Biological Abstracts, Inc. W72-05386

THE BIOECOLOGICAL CHARACTERISTICS OF PISTACHIO IN THE FOOTHILLS OF THE KIRGHIZRANGE, A. S. Bulychev.

Ilim: Frunze. 1969. 81p. Illus. Pr. 30 kopecks. Identifiers: Anatomy, Ecological, Foothills, Kirghiz, Leaf, Light, Moisture, Morphology, Pistachio-D, Pistacia-Vera-D, Range, Tempera-

The growth and development of Pistacia vera under unirrigated conditions are analyzed at various ecological conditions, at various presowing soil cultivation methods, at different sowing densities, etc. The anatomical and morphological structure of the leaf is examined in detail as is its relation to available moisture, illumination and air temperature. Methods are suggested for the growing of pistachio in the arid areas of the foothills.--Copyright 1971, Biological Abstracts, Inc. W72-05392 THE CONSERVATION AND RATIONAL USE OF THE PLANT AND ANIMAL WORLD OF DESERTS,

For primary bibliographic entry see Field 04A. W72-05401

MODIFICATIONS OF PEAT SOILS UNDER THE INFLUENCE OF DRAINAGE AND CUL-TIVATION: PROCEEDINGS OF THE SCIENTIFIC METHODS CONFERENCE OF MEMBER COUNTRIES OF THE COUNCIL FOR MUTUAL ECONOMIC AID.

For primary bibliographic entry see Field 02G. W72-05403

WATER DISTRIBUTION SYSTEM CANALS Societe Grenobloise d'Etude et d'Applications Hydrauliques (France) (Assignee). For primary bibliographic entry see Field 04A. W72-05429

RENOVATING OLD CITRUS GROVES IN INDI-

AN RIVER AREA,
IFAS Agricultural Research Education Center,
Lake Alfred, Fla.
Proc. J. Koo, and Paul J. Driscoll.
Proc. Fla State Hort Soc. 83: 71-74, 1970.

Identifiers: Capacity, Cation, Citrus-D, Florida, Grapefruit-D, Groves, Holding, Indian River, Ion, Mineral, pH, Renovating, Soil. A 20-acre block of old and low-producing

A 20-acre block of old and low-producing grapefruit trees on single beds was pushed and the soil leveled. The soil profile was modified by plowing to a depth of 30-36 in. prior to the construction of new beds in 1 10-acre section. A dragline was used in the remaining 10 acres; in 15-acre section, clay and subsoil materials was nived with earl in clay and subsoil materials were mixed with sand in the rows where the trees were to be planted. The soil was restructured in the other 5-acre section by mixing clay from the water furrow with sand on the beds to a depth of about 18 in. Double beds were constructed for the new planting. Soil sam-ples collected before and after the soil was restructured, showed marked differences in water-holding and cation-exchange capacities, pH, calcium, and Mg contents where clay-marl material was mixed with sand. Little difference was found where the mixing did not involve clay. Significant correlations were found between tree growth and available soil moisture, and extractable soil Ca and Mg contents.--Copyright 1971, Biological Abstracts, Inc. W72-05573

DETERMINATION OF RESIDUES OF CAR-BOFURAN AND ITS TOXIC METABOLITES BY ELECTRON CAPTURE GAS CHROMATOG-RAPHY AFTER DERIVATIVE FORMATION, Agricultural Research Service, Yakima, Wash.

For primary bibliographic entry see Field 05A. W72-05586

RAPID MEASUREMENTS OF RELATIVE TUR-

GIDITY IN MAIZE (ZEA MAYS L.),
Department of Agriculture of New South Wales,
Lecton (Australia). Agricultural Research Station.
Lloyd A. Downey, and J. W. Miller.
New Phytol. 70 (3): 555-560. 1971. Illus.

Identifiers: Discs, Leaf, Maize-M, Measurements, Photographic, Rapid, Standards, Tissue, Turgidity, Uptake, Zea-Mays-M.

Two rapid methods of assessing relative turgidity in maize are described. The first involved measuring the water uptake by discs of leaf tissue but omitting the oven dry weight from the calculation. Where the position on the leaf was standardized, the relationship was linear (r = 0.999\*\*\*) over a wider range than normally encountered in field conditions. The regression relationship held for plants grown under a wide variety of environmen-

### WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Control of Water on the Surface—Group 4A

tal conditions and at various stages of development. The 2nd method utilized a series of photographic standards of plants at different relative turgidities. Relative turgidity could then be estimated visually by comparing the plant and the photographic standards. Accuracy with either method was similar to the experimental error relative turgidity measured by normal means. Both offer a considerable saving in time, especially the photographic standard method which allows instantaneous readings to be made. This should permit field workers to assess rapidly the water status of the crop without the labor involved in conventional measurements.—Copyright 1971, Biological Abstracts, Inc. W72-05654

NITRATE IN DEEP SOIL PROFILES IN RELA-TION TO FERTILIZER RATES AND LEACHING VOLUME, California Univ., Riverside. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W72-05655

MODEL OF SOIL WATER USE BY TEA, La Trobe Univ., Bundoora (Australia). School of Agriculture. S. T. Willatt.

Agric Meteorol. 8 (4/5): 341-351. 1971. Illus. Identifiers: Deficit, Irrigation, Malawi, Model, Moisture, Nyasaland, Soil, Tea-D, Yield.

The rate of water used by non-irrigated unpruned tea in Malawi depends on the soil water deficit although this rate was modified when the tea was pruned. Irrigated tea used water at a fairly constant rate of 0.9Eo (open water surface evaporation) although some modification occurred due to weather factors. The results of sampling for water use were employed to produce a model for predicting water status of tea soils. Yield in Sept., Oct. and Nov. were well correlated with water deficit at the beginning of each month.—Copyright 1971, Biological Abstracts, Inc. W72-05713

DATA ON THE DUNAMICS OF THAW TEM-PERATURE AND MOISTURE IN BOG SOILS IN THE SOUTH OF CENTRAL SIBERIA, For primary bibliographic entry see Field 02G. W72-05726

TESTING SODIUM HAZARD PREDICTIONS, New Mexico State Univ., University Park. Dept. of Agronomy. For primary bibliographic entry see Field 05B. W72-05731

RIDGE AND FURROW LIQUID WASTE DISPOSAL IN A NORTHERN LATITUDE, National Center for Urban and Industrial Health, Cincinnati, Ohio. Solid Wastes Program. For primary bibliographic entry see Field 05D. W72-05808

SAN FRANCISCO BAY-DELTA WATER QUALITY CONTROL PROGRAM, California State Water Resources Control Board, Sacramento. San Francisco Bay-Delta Program. For primary bibliographic entry see Field 05G. W72-05809

### 04. WATER QUANTITY MANAGEMENT AND CONTROL

# 4A. Control of Water on the Surface

TRENDS ESTABLISHED FROM 20 YEARS OF PUMPED STORAGE-AND FOR THE FUTURE, Acres Consulting Servies Ltd., Toronto, Canada. For primary bibliographic entry see Field 08C. w72.05294

SUPERVISING RESERVOIRS AND CHOOSING THE MOST ECONOMIC SIZE FOR NEW HYDROELECTRIC INSTALLATIONS, Hydro-Quebec, Montreal.

Andre Turgeon.

Infor, Canadian Journal of Operational Research and Information Processing Vol. 9, No. 3, p 263-272, November, 1971. 5 fig.

Descriptors: \*Costs, \*Linear programming, \*Reservoir operation, \*Hydroelectric power, \*Optimization, Power-plants, Flood control. Identifiers: Hydro-Quebec, Ottawa river.

The determination of optimal reservoir capacities is discussed and the scheduling among various power plants of the production of firm energy, given known hydraulic conditions, in a manner so as to minimize unproductive spillage and surplus energy production while maintaining the highest possible water levels at each powerhouse reservoir. Both linear programming and simulation models were used to solve this problem for Hydro-Quebec in Canada. The models were tested using 15 years of observed river flow data and the results for the predicted average production of energy were within one percent of the average real value recorded. A subsequent economic study indicated that hydropower development would be more profitable than equivalent thermal power. Factors that influenced the selection of new hydro-electric power plants, thermal power on uclear power plants were also reviewed. (Ligon-Cornell)

A DECOMPOSITION APPROACH TO NON-LINEAR PROGRAMS AS APPLIED TO RESER-VOIR SYSTEMS, State Univ. of New York, Stony Brook. Urban

State Univ. of New York, Stony Brook. Urban Science and Engineering Program.
L. D. Bodin, and T. G. Roefs.
Networks, Vol. 1, No. 1, p 59-73, 1971. 10 ref.

Descriptors: "Networks, "Stochastic processes, "Streamflow, "Reservoirs, "Optimization, Peak discharge, Continuity equation, Energy equation. Identifiers: Dantzig-Wolfe decomposition.

The operating policy over time was determined for a network of water reservoirs or dams arranged according to an arbitrary topology. If streamflow was a known quantity, then the problem could be formulated as a large nonlinear program (several hundred nonlinear constraints as a minimum). Since streamflow was a random variable, the problem became a large stochastic process which could be solved by using either the Dantzig-Wolfe procedure or separable programming. (Ligon-Cornell) W72-05321

COMPUTER ANALYSIS OF WATER DISTRIBUTION SYSTEMS: PART I - FORMULATION OF EQUATIONS, Medical Univ. of South Carolina, Charleston. Dept. of Biometry.
Chan F. Lam, and M. L. Wolla.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 98, No. 2, p 335-344, February, 1972. 2 fig, 19 ref.

Descriptors: \*Computer programs, \*Computers, \*Head loss, \*Steady flow, \*Hydraulic models, \*Water management, Model studies, Flow, Hazen-Williams Equation.
Identifiers: Algorithms, Hardy-Cross method.

Based upon the theory of linear graph, a system of node equations was formulated that described the steady state flow of a water distribution system. These equations could be generated by means of a digital computer. In contrast to other approaches, the system of node equations was generated only once at the beginning of an analysis process. The system of equations was in such a form that minimal time was required to evaluate it during an iterative solution process. Furthermore, different headloss relationships, in addition to the Hazen-Williams formula, could be used in the computer program. (Ligon-Cornell)

FEASIBILITY OF THE METROPOLITAN WATER 'NTELLIGENCE SYSTEM, (INTEGRATED AUTOMATIC OPERATIONAL CONTROL),

American Society of Civil Engineers, New York. M. B. McPherson.

Available from the National Technical Information Service as PB-207 301, \$3.00 in paper copy, \$0.95 in microfiche. ASCE Urban Water Resources Research Program Technical Memorandum No. 15, December, 1971, 110 p, 8 fig, 300 ref, 3 append. OWRR C-3142 (No. 3693 (1).

Descriptors: \*Automatic control, \*Operations, \*Automation, \*Water management (Applied), \*Control systems, Integrated control measures, Areal, Remote control, Monitoring, Mathematical models, Computer programs, Telemetry, Instrumentation.

Identifiers: \*Metropolitan, \*Urban water

Identifiers: \*Metropolitan, \*Urban watersources, Surveillance, Simulation.

Feasibility of multiservice, or integrated, water resource automatic operational control on a metropolitan scale encounters several obstacles. Because no example of a metropolitan agency with total areawide, integrated water management authority exists, there is presently no identifiable potential user. Who would pay for the control system is a related enigma. Some necessary sensors for automation are absent, particularly for water quality control and wastewater treatment. However, the much larger technical problem is in the development of required 'software', including control logic and mastery and simulation of certain processes. Development progress is insufficient to assess the probable effectiveness of the concept in meeting basic performance criteria: service, reduced total costs, conflict amelioration, reliability, offsetting increased system complexity, and reducing system vulnerability to disruption. However, the present trend is an accretion of capability, and several levels will probably develop simultaneously in response to varying local requirements and conditions. Automation of water distribution systems has advanced the farthest and total control may soon be achieved. Documented cases supplemented by personal discussions are included, illustrated mainly by examples of the most advanced technology. (McPherson-ASCE) W72-05328

SYNTHETIC SERIES PRODUCED BY MEANS OF PROBABILITY ANALYSIS AS APPLIED TO THE RIVER RHINE,

THE RIVER RHINE, For primary bibliographic entry see Field 02E. W72-05330

CONTROL OF WATERLILIES WITH DICHLOBENIL,
Agricultural Research Service, Prosser, Wash.

### Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4A—Control of Water on the Surface

R. D. Comes, and L. A. Morrow Weed Sci. 19 (4): 402-405. 1971. Illus. Identifiers: Control. Dichlobenil. Herbicide. Nuphar-Polysephalum-D, Nymphaea-Tetragona-D. Waterlilies-M.

Early postemergence applications of 2,6-dichlorobenzonitrile (dichlobenil) granules at 15 lb/A controlled 97 to 99% of dwarf waterlily lb/A controlled 97 to 99% of dwarf waterlily (Nymphaea tetragona Georgi) in a shallow lake for 3 yr. Dichlobenil alone was superior to a combination of dichlobenil and (2,4-dichlorophenox-y)acetic acid (2,4-D) for the control of dwarf waterlily and western yellow waterlily (Nuphar polysepalum Engelm). Reinfestation was more rapid on plots 25 by 25 ft in size than on plots 50 by 90 ft in size When a high degree of control was 50 ft in size. When a high degree of control was maintained for 2 or 3 yr, rhizomes of drawf water-lily and a 1 to 2-ft layer of hydrosoil floated to the lake surface 17 mo. after dichlobenil was applied .--Copyright 1971, Biological Abstracts, Inc. W72-05369

SILVICULTURAL AND PHYSIOLOGICAL BASES OF THE PRINCIPLES OF IMPROVEMENT CUTTINGS IN THE MOUNTAIN FORESTS OF THE GEORGIAN SSR, S. S. Chitashvili.

Metsniereba: Tbilisi. 1969. 274p. Illus. Pr. 1 ruble 64 kopecks.

Identifiers: Bases, Beech-D, Book, Cuttings, Fir-G, Forests, Georgian-USSR, Mountain, Oak-D, Photosynthesis, Physiological, Pine-G, Principles, Protection, Regulation, Silvicultural, Soil, Spruce-

The general characteristics of the total forest area and its distribution according to soil categories and age groups of the stands, as well as according to the forest type groups (pine, oak, beech, spruce-fir) are described. The types and methods of im-Iff) are described. The types and methods of improvement cuttings are examined as is also their effect on the soil-protective and water-regulating properties of the stands, and on their photosynthetic activity and productivity. The economic efficiency of improvement cuttings of various intensity and the possibility of utilizing small wood obtained in improvement cuttings are indicated.—Copyright 1971, Biological Abstracts, Inc.

W72-05393

# APPLICATION OF SYNTHETIC FILMS IN

Lesnaya promyshlennost: Moscow. 1969, 176p. Il-

Leshaya promyamentasis. Mescarian St. 1885. Lilus. Pr. 67 kopecks.
Identifiers: Book, Collection, Films, Forestry, Grafting, Pine-G, Propagation, Receptacles, Resin, Spruce-G, Synthetic, USSR.

The results of the use of films for increasing the efficiency of grafting and of propagation by green cuttings are reported. A description is given of various constructions made with film cover, used for the forced growth of seedlings of pine, spruce and other tree species in various zones of USSR. The use of polyethylene films as receptacles for the collection of resin and for other purposes is recounted.--Copyright 1971, Biological Abstracts,

W72-05396

#### NEW HYBRID VARIETIES OF POPLARS IN IR-RIGATED STEPPES,

G. G. Dzhalilov.

Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior. 8: 221-223. 1968. Identifiers: Hybrid, Irrigated, Poplar-D, Poplars-D, Populus-Balsamifera-D, Populus-Berolinensis-D, Populus-Deltoides-D, Populus-Marilandica-D, Populus-Nigra-D, Populus-Nigra-Pyramidalis-D, Populus-Simoni-D, Red-Nerved, Steppes, USSR,

Out of 154 local and foreign forms and varieties of poplars, the most promising for the Kura-Araks lowland were the following: Populus nigra pyramidalis, P. nigra pyramidalis X P. simoni, P. simoni, P. noch' No. 26, P. berolinensis, P. nigra X P. balsamifera, red-nerved poplar, P. marilandica, P. nigra pyramidalis X P. nigra, and P. deltoides.—Copyright 1971, Biological Abstracts, Inc. W72-05397

# EFFECT OF SUPERFICIAL DRAINAGE ON THE TREE NUTRITION,

M. I. Vomperskaya. Lesovedenie. 6. 45-52. 1969. (English summary) Identifiers: Beech-D, Birch-D, Drainage, Nutrition, Pine-G, Spruce-G, Superficial, Tree.

The causes of improvement in the growth of spruce, pine and birch in temporarily waterlogged peaty podzolic gley soils and podzolic gley light loamy soils which were drained by furrows 25-30 cm deep at a distance of 5, 10, 15 m were studied. The amount of easily available basic nutrients in the soil did not change substantially with drainage due to the improvement of N assimilation by spruce, pine and beech. Best results (as measured by the N content in the needles and by the rate of increment) were obtained when the furrows were 5 m apart with tress planted in the furrow slice .--Copyright 1971, Biological Abstracts, Inc. W72-05399

### FOREST REGENERATION GEOGRAPHY IN THE ANGARA RIVER AREA, L. V. Popov.

Izv Vost-Sib Otd Geogr O-Va Sssr. 66: 126-131.

Identifiers: Angara, Forest, Geography, Management, Regeneration, Resource, River, USSR.

The territory adjoining the Angara River was divided into 5 zones according to the forest composition, the stand quality class, the features of the hydrothermal conditions under the forest canopy and on the felling sites, forest regeneration felling sites, and the trend of the regeneration process. The 5 zones are: Trans-Angara, Angara River, Chuna-Ilim rivers, Ona-Oka rivers, and the SOUTHERN ZONE. Conditions of forest regeneration on the felling sites deteriorate from the 1st zone to the 5th one. In all the zones, felling sites undergo forest regeneration; in the latter 3 sites undergo forest regeneration; in the latter 3 zones it is necessary to have recourse to forest planting on 3-5, 10-15, and 25%, respectively, of the felling site area.—Copyright 1971, Biological Abstracts, Inc. W72-05400

### THE CONSERVATION AND RATIONAL USE OF THE PLANT AND ANIMAL WORLD OF DESERTS,

N. T. Nechaeva, and A. K. Rustamov.

Probl Osvoeniya Pustyn'. 2. 23-29. 1970. (English summary). Identifiers:

Animal, Conservation, Deserts, Husbandry, Plant, Rational.

In connection with the creation of the V. I. Lenin Karakum Canal in Turkmenistan and the Golodnaya Step' Canal in Uzbekistan, large centers of industry and agriculture have arisen, bringing up the question of the need for conservation. Here an important part is that of preserves and posted areas. The appearance in the desert of automotive areas. The appearance in the desert of automotive transport has led to a reduction in the productivity of pastures and the breakdown of light soils. The insufficient precipitation in the area and the absence of sources of fresh water for animal husbandry is one of the causes for the uneven utilization of pastures. The use of natural grazing areas in conjunction with prepared feeds is not yet widespread. The correct organization of conservation and exploitation of animals is based on the knowledge of their biology and population sizes. Preserves must be organized. The productivity of game lands must be raised by restoring the population sizes of aboriginal animals and acclimatizing new forms. The losses which agricultural activities

have caused among the fauna should be made up. There should be widespread introduction of biological methods of protecting plants. Strict observance of and compliance with all arid-zone conservation measures can make possible a rise in the biological productivity and the profitability of game lands.—Copyright 1971, Biological Abstracts Inc. stracts, Inc. W72-05401

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RHDENERAtis

#### WATER DISTRIBUTION SYSTEM FOR

CANALS, Societe Grenobloise d'Etude et d'Applications Hydrauliques (France) (Assignee).

ryutaunques (France) (Assignes). Giles Combes, and Alexandre Preissmann. U.S. Patent No. 3,500,647, 2 p. 2 fig, 3 ref; Patent Abstracts Section, Official Gazette, Vol. 872, No. 3, p. 749, March 17, 1970.

Descriptors: \*Patents, \*Irrigation canals, \*Discharge measurement, Water levels, Conservation, Agriculture, Water management, \*Distribution systems.

Identifiers: \*Water level detection, Discharge con-

A water level detection method makes it possible to operate the irrigation canal structure just as effectively as known downstream discharge control systems with less operating liquid storage. The required freeboard of such reaches may be reduced to such extent as to effect a considerable saving in the cost of the canal structure. (Sinha-OEIS) W72-05429

### NUMERICAL SIMULATION TECHNIQUE FOR VERTICAL DRAINAGE FROM COLUMN,

Research, Wageningen (Netherlands). For primary bibliographic entry see Field 02G. W72-05479

### PROBABILITY DISTRIBUTION OF FLOW EVENTS IN THE NEGEV AREA OF ISRAEL, Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.

For primary bibliographic entry see Field 02E. W72-05487

### LOPEZ WATER SUPPLY PROJECT, Koebig and Koebig, Inc., Los Angeles, Calif. C. H. Lawrance, K. G. Tranbarger, and R. A.

Journal of the American Water Works Association, Vol. 63, No. 11, p 711-727, November 1971. 16 fig, 7 tab, 15 ref.

Descriptors: \*Water supply, \*Water resources development, \*Distribution systems, \*Water quality, Water conservation, Wildlife conservation, Flood control, Recreation, Hydrologic data, tion, Flood control, Recreation, riyurologic ustar, Water treatment, Stream gages, Groundwater, Safe yield, Algae, Mineralogy, Turbidity, Color, Alkalinity, Volumetric analysis, Fish, Intake structures, Carbon dioxide, Calcium carbonate, Calcium, Magnesium, Sodium, Iron, Manganese, Calcium, Sulfates, Chlorides, Chlorine, Ions, Bicarbonates, Carbonates, Copp Fluorine, California. Copper, Nitrates, Fluorides,

Identifiers: \*Lopez Water Supply Project, Lopez Creek, Arroyo Grande Creek.

The Lopez Water Supply Project, a multipurpose water-supply system, has been recently completed in San Luis Obispo County, California at a cost of \$17,714,000. This project incorporates water conservation, flood control, domestic water supply, fish and wildlife preservation and recreation. The Lopez and Arroyo Grande Creeks are the sources of water utilized by this project. They were sam-pled and quality checked for mineral content, alkalinity, hardness, color and turbidity prior to and after construction of the Lopez Reservoir. The

### WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

### Control of Water on the Surface—Group 4A

laboratory analytical data for the creeks and the reservoir are summarized in tabular form. The features of the entire project are summarized including information on the intake and outlet facilities (piping and instrumentation) of the reservoir. Algal problems and control and the effects of the project on fish and wildlife are discussed. (Holoman-Battelle) W72-05594

END EFFECTS IN MODELS FOR SEEPAGE BELOW WEIRS,

College of Engineering, Madras (India). For primary bibliographic entry see Field 08B. W72-05624

LAND USE CONFLICT AND PUBLIC POLICY, California Univ., Davis. Dept. of Economics. For primary bibliographic entry see Field 06B. W72-05674

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES: A REVIEW AND EVALUATION, Economic Research Service, Washington, D.C. Natural Resources Economics Div. For primary bibliographic entry see Field 06B. W72-05675

THE NAVIGATION SERVITUDE AND THE SEVERANCE DOCTRINE,

South Dakota Univ., Vermillion. School of Law. For primary bibliographic entry see Field 06E. W72-05756

WATER AND RELATED LAND RESOURCES PLANNING, A POLICY STATEMENT. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06B. W72-0575

RECHARGE BASINS FOR DISPOSAL OF HIGHWAY STORM DRAINAGE-THEORY, DESIGN PROCEDURE, AND RECOMMENDED ENGINEERING PRACTICES,

New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau. R. J. Weaver.

Available from the National Technical Information Service as PB-201 959, \$3.00 in paper copy, \$0.95 in microfiche. May 1971. 64 p, 13 fig, 17 ref. BPR 301, (Task 6-6-3).

Descriptors: \*Storm runoff, \*Drainage water, \*Conjunctive use, \*Highways, \*Groundwater recharge, \*Surface-groundwater relationships, Drainage engineering, Runoff, Surface runoff, Induced infiltration, Recharge, Reclaimed water, Water reuse, Water supply, Water resources development, New York, Highway effects, Water spreading, Infiltration.

Identifiers: \*Highway storm drainage disposal, \*Recharge basins.

Comprehensive procedures are presented for engineering and maintenance of recharge basins used for disposal of highway drainage. A new theory of unsaturated, unsteady-state flow is established, applicable to basin design and other problems involving infiltration of water into an unsaturated soil. Assumptions and criteria for theoretical treatment were established by an extensive model basin test program and the results back-checked against observed infiltration in model tests. The final equations are algebraic and contain no abstract or inassessable terms. The report is divided into parts: (1) principles and theory, (2) proposed design procedures including run-off analysis needed in engineering design of basin size, and (3) recommended practices for construction and maintenance. Each part is written for separate use, and all are summarized at the end of the report. The objective is to place all elements of basin en-

gineering on a rational basis, so as to take best advantage of storm drainage disposal by recharge. (Poertner)

DRAINAGE CORRELATION RESEARCH PRO-JECT, (VOL. I.).

JECT, (VOL. I.), Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics. T. T. Williams.

Available from the National Technical Information Service as PB-200 870, \$3.00 in paper copy, \$0.95 in microfiche. Final Report, May 1971. 161 p, 67 fig, 9 tab, 44 ref. BPR 41-40.

Descriptors: "Storm runoff, "Drainage water, "Highways, "Peak discharge, "Rainfall-runoff relationships, "Drainage engineering, Engineering structures, Drainage systems, Drainage practices, Culverts, Road design, Washouts, Rational formula, Stochastic processes, Montana. Identifiers: Rural watersheds.

An important problem in highway design is that of determining flow capacities required for drainage structures. The completed research effort resolved some of the problems to estimating peak runoff. The report presents the total experience of Mon-tana with the problems of gaging and collecting meteorologic and hydrologic variables. Several exploratory studies using new techniques to estimate peak discharge rates on small watersheds were made. A new approach of rainfall frequency-peak flow frequency method for estimating peak discharge was developed. It correlated precipitation to streamflow for that part of Montana east of the Rockies. A preliminary study applying a principal component analysis with varimax rotation was performed for five small watersheds with 50 recorded storm events. The relative importance of 29 independent variables was described and equations estimating volumes and peaks of runoff developed. The Soil Conservation Service method of estimating flood volume was explored for applicability to rural watersheds. Several stochastic methods for estimating flood peaks were tested for suitability to the specific problems of Montana. Because unsatisfactory data was used in develop-ing and testing the methods reported for estimating peak runoff rates, the author does not recommend application of the method for practical use. (See also W72-05796) (Poertner) W72-05795

DRAINAGE CORRELATION RESEARCH PROJECT VOL. II.

JECT, VOL. II, Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics. T. T. Williams.

Available from the National Technical Information Service as PB-200 871, \$3.00 in paper copy, \$0.95 in microfiche. Final Report, May 1971. 269 p, 205 fig, 11 tab. BPR 41-40.

Descriptors: \*Storm runoff, \*Drainage water, \*Highways, \*Peak discharge, \*Rainfall-runoff relationships, \*Drainage engineering, Engineering structures, Drainage systems, Drainage practices, Culverts, Road design, Washouts, Rational formula, Stochastic processes, Montana, Parametric hydrology, Documentation.

Identifiers: Rural watersheds.

Volume II consists of nine appendixes relating to the basic report which concerns the development and testing of methods to determine peak stormwater runoff rates in rural areas. The purpose was to investigate and test methods that can be used by design engineers to estimate probable peak runoff rates. Improved methods are needed for making such estimates in order to facilitate the design of culverts and highway bridges over streams. One appendix is a review of hydrology concepts including parametric methods and stochastic methods for estimating peak discharge rates and associated frequency. Four other appendixes consist of maps, exhibits, tables and figures concerning

watershed characteristics, soil characteristics, and hydrologic data. Other appendixes concern: variables for multivariate statistical studies, comparison of stochastic peak flow methods, tests of annual peak discharge data to determine hydrologically homogenous areas, and effect of recordlength on peak flow predictions. (See also W72-05795) (Poertner) W72-05796

STREAMS AND DRAINAGE BASINS, FULTON COUNTY, NEW YORK,

Fulton County Planning Dept., Johnstown, N.Y. Holbert W. Fear.

Available from the National Technical Information Service as PB-201 884, \$3.00 in paper copy, \$0.95 in microfiche. December 1970. 40 p, 5 fig, 4 tab, 10 ref. HUD NYP-223.

Descriptors: \*River basins, \*Watersheds (Basins), \*Planning, \*New York, \*Streams, \*Flood plains, Hydrologic data, Water storage, Impoundments, Recreation, Streamflow, Runoff forecasting, Surveys, Land use, Rivers, Maps, Water resources. Identifiers: Fulton County (NY).

The first phase of comprehensive investigation of the water resources of Fulton County is presented. Fulton County is divided into two major river basins, the Sacandaga River-Upper Hudson River Basin, and the Mohawk River Basin. A comprehensive list and maps of major streams and their tributaries in both the Mohawk River Basin and Sacandaga River Basin has been prepared to provide reliable data on their respective drainage areas in Fulton County. Delineation and measurement of these areas have been tabulated in square miles, and combined for the size of their total watersheds. Studies were made of potential flood hazards and flood areas were delineated. Potential impoundment areas are listed for water storage to meet increasing water requirements in western Fulton County and in the vicinity of Gloversville and Johnstown. Suggestions are made concerning water recreation, conservation, and measuremen of precipitation and stormwater runoff. A list of water bodies in Fulton County, giving the elevation, surface area, shore miles and type of land use development, has been prepared and is included. W72-05798

WATER/SEWER FUNCTION PLAN AND PROGRAM--PRELIMINARY.

Central Piedmont Regional Council of Local Government, N.C. For primary bibliographic entry see Field 05D. W72-05799

REPORT ON IMPROVEMENTS TO THE BOSTON MAIN DRAINAGE SYSTEM, VOL. I. Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 05G. W72-05800

REPORT ON IMPROVEMENTS TO THE BOSTON MAIN DRAINAGE SYSTEM, VOL. 2. Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 05G. W72-05801

SASKATCHEWAN'S WATER RESOURCES AND UTILIZATION, Department of the Environment, Ottawa (On-

Department of the Environment, Ottawa (Or tario). Inland Waters Branch. For primary bibliographic entry see Field 02E. W72-05844

CHLORIDE CONTROL - ARKANSAS AND RED RIVER BASINS, Army Engineer District, Tulsa, Okla.

Army Engineer District, Tulsa, Okla. For primary bibliographic entry see Field 05G. W72-05876

### Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4B - Groundwater Management

### 4B. Groundwater Management

INTERNATIONAL SURVEY ON MANAGE-MENT OF ARTIFICIAL RECHARGE - ANALY-SIS AND SYNTHESIS OF RESPONSES (INVEN-TAIRE INTERNATIONAL DES AMENAGE-MENTS D'ALIMENTATION ARTIFICIELLE -DEPOUILLEMENT ET SYNTHESE DES RESPONSES), Burgeap S.A., Paris (France).

L. Bourguet.

Bulletin, Vol 16, No 3, p 51-102, September 1971. 5 plate, 20 tab, 6 append.

Descriptors: \*Artificial recharge, \*Injection wells, \*Cost analysis, Surveys, Statistics, Sampling, Correlation analysis, Regression analysis.

An analysis is presented of the 121 answers to an international survey of groundwater recharge. Aims, benefits, types of recharge, aquifers, and size of installations are discussed. Correlations and regressions were found relating permeability, size of equipment, and injection rate, and relating recharge to capital investment. (Knapp-USGS) W72-05331

FORMATION WATERS, HOT SPRINGS AND MINERALIZATION PHENOMENA ALONG THE EASTERN SHORE OF THE GULF OF

Geological Survey of Israel (Jerusalem). For primary bibliographic entry see Field 02K. W72-05333

IMPORTANT CONSIDERATIONS IN THE PROCESS OF DESIGNING A GROUNDWATER DATA COLLECTION PROGRAM, Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 07A.
W72-05341

PRINCIPLES OF GROUNDWATER DATA

ACQUISITION, Department of Energy, Mines and Resources, Ottawa (Ontario). Computer Research Section. For primary bibliographic entry see Field 02F. W72-05342

PROPOSED CRITERIA FOR DESIGN OF A DATA COLLECTION SYSTEM FOR GROUND-WATER HYDROLOGY IN CALIFORNIA, 1970-

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02F. W72-05343

CRITERIA FOR GROUNDWATER LEVEL DATA NETWORKS FOR HYDROLOGIC AND MODELING PURPOSES.

California State Dept. of Water Resources, Sacra-

For primary bibliographic entry see Field 07A. W72-05344

THE ACCURACY OF GROUNDWATER CON-TOUR MAPS.

California State Dept. of Water Resources, Sacramento. For primary bibliographic entry see Field 04B. W72-05345

THE ACCURACY OF GROUNDWATER CON-TOUR MAPS.

California State Dept. of Water Resources, Sacra-

Water Resources Research, Vol 8, No 1, p 201-204, February 1972. 3 fig, 2 tab, 2 ref.

Descriptors: \*Data processing, \*Mapping, \*Contours, \*Water table, Water levels, California, Networks, Hydrologic data, Maps, Water management (Applied).
Identifiers: \*Groundwater maps.

The accuracy of groundwater contour maps must be determined. A method of making accuracy statements about groundwater contour maps was developed along with its necessary assumptions. The computer contouring method used in the accuracy tests is described. Results of a limited number of map accuracy tests are presented in terms of dispersing differences of elevations and volume differences above a base. The method and results of the test may be applied to groundwater level network design. Other applications are suggested. (Knapp-USGS) W72-05345

ANALYSES OF SELECTED STATISTICAL METHODS FOR ESTIMATING GROUND-WATER WITHDRAWAL,

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 02F. W72-05346

SURROGATE MODELING.

General Electric Co., Santa Barbara, Calif. TEM-For primary bibliographic entry see Field 02F. W72-05347

DEFINITION OF HYDROLOGIC UNITS FOR WATER STUDIES IN ARKANSAS, Geological Survey, Little Rock, Ark For primary bibliographic entry see Field 02F. W72-05348

AN APPROACH TO THE DESIGN OF STATE-WIDE OR REGIONAL GROUNDWATER IN-FORMATION SYSTEMS, Geological Survey, St. Paul, Minn. Water

Resources Div. For primary bibliographic entry see Field 02F. W72-05349

DATA NEEDS FOR PREDICTING PROBLEMS CAUSED BY THE USE OF SUBSURFACE Geological Survey, Denver, Colo. Water

Resources Div. For primary bibliographic entry see Field 05B. W72-05350

CAVES (PESCHERY).

Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.
For primary bibliographic entry see Field 02K. W72-05359

HYDROGEOLOGY, HYDRODYNAMICS AND FORMATION OF GROUNDWATERS IN ORE DEPOSITS OF CENTRAL KAZAKHSTAN (GIDROGEOLOGIYA, GIDRODINAMIKA I FORMIROVANIYE PODZEMNYKH VOD RUD-NYKH MESTOROZHDENIY TSENTRAL'NOGO

KAZAKHSTANA), Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Gidrogeologii i Gidrofiziki. For primary bibliographic entry see Field 02F. W72-05416

INJECTION WELLS POSE A POTENTIAL American Chemical Society, Washington, D.C.

For primary bibliographic entry see Field 05G.

WELL CONSTRUCTION REGULATION AND STANDARDS.

For primary bibliographic entry see Field 08A. W72-05525

HYDROGEOLOGY OF SOLID WASTE DISPOSAL SITES IN NORTHEASTERN IL-WASTE

LINOIS, Illinois State Geological Survey, Urbana For primary bibliographic entry see Field 05B. W72-05564

STEAM CLEANED WATER,

Office of the Chief of Engineers (Army), Washington, D.C. For primary bibliographic entry see Field 03D. W72-05576

POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS,

Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch. For primary bibliographic entry see Field 05B. W72-05651

SUMMARY OF THE HYDROLOGIC SITUA-TION ON LONG ISLAND, NEW YORK, AS A GUIDE TO WATER-MANAGEMENT ALTER-NATIVES,

Geological Survey, Washington, D.C.
O. L. Franke, and N. E. McClymonds.
Available from GPO, Washington, DC 20402 -Price \$0.65 cents (paper cover). Geological Survey Professional Paper 627-F, 1972. 59 p, 39 fig, 19 tab,

Descriptors: \*Hydrogeology, \*Saline water intru-sion, \*Urbanization, \*Artificial recharge, \*New York, Water levels, Groundwater, Hydrologic budget, Water balance, Base flow, Discharge (Water), Water yield, Water management (Ap-Identifiers: \*Urban hydrology, \*Long Island

The groundwater reservoir of Long Island is a wedge-shaped mass of saturated unconsolidated deposits that overlie nearly impermeable consolidated bedrock and attain a thickness of about 2,000 feet. The estimated volume of material saturated volume of material saturated volume. rated with fresh groundwater in the area is about 180 cubic miles. At present, more than 2,000 recharge basins recharge the groundwater reservoir with substantial quantities of direct runoff. The estimated average inflow to these basins is about 80 mgd. An estimated additional 60 mgd of direct runoff from urban areas discharges to streams or directly to salty water. Gross groundwater pumpage increased from about 100 mgd in 1940 to about 330 mgd in 1965. The total sewage ef-fluent discharged increased from about 15 mgd in 1950 to about 75 mgd in 1965. Most of this increased effluent was derived from groundwater, and its removal from the area has caused lowering of groundwater levels. Much of the shallow groundwater is contaminated with domestic wastes from cesspools and septic tanks. Fresh groundwater will ultimately be depleted if total outflow exceeds total inflow. Proposals to manage the water resources of Long Island include barrier injection wells, shallow skimming wells, recharge of treated sewage effluent through wells or shal-low basins, and planned encroachment of salty groundwater. (Knapp-USGS) W72-05658

RECHARGE BASINS FOR DISPOSAL OF HIGHWAY STORM DRAINAGE-THEORY, DESIGN PROCEDURE, AND RECOMMENDED ENGINEERING PRACTICES,

New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau. For primary bibliographic entry see Field 04A. W72-05793

### WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

### Watershed Protection—Group 4D

RIDGE AND FURROW LIQUID WASTE DISPOSAL IN A NORTHERN LATITUDE, National Center for Urban and Industrial Health, Cincinnati, Ohio. Solid Wastes Program. For primary bibliographic entry see Field 05D. W72-05808

RESEARCH ON ABATEMENT OF POLLUTION AND MANAGEMENT OF ORGANIC WASTES FROM CATTLE FEEDLOTS IN NORTHEAST-ERN COLORADO AND EASTERN NEBRASKA, Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05G. W72-05819

LATE TERTIARY AND QUARTERNARY HYDROGEOLOGY OF ESTANCIA BASIN, CENTRAL NEW MEXICO, New Mexico Univ., Albuquerque. Dept. of Geolo-

For primary bibliographic entry see Field 02F. W72-05851

GEOHYDROLOGY OF HUALAPAI AND SACRAMENTO VALLEYS, MOHAVE COUN-

Geological Survey, Washington, D.C.
J. B. Gillespie, and C. B. Bentley.
Available from GPO, Washington, D.C. 20402. Price \$1.25 (paper cover). Geological Survey Water-Supply Paper 1899-H, 1971. 37 p, 6 fig, 2 plate, 4 tab, 30 ref.

Descriptors: \*Groundwater, \*Hydrogeology, \*Semiarid climates, \*Arizona, Aquifers, Water wells, Groundwater recharge, Infiltration, Streamflow, Flow rates, Stream gages, Aquifer characteristics, Water yield, Geology, Groundwater movement, Water-level fluctuations, Water quality, Surface waters.
Identifiers: \*Mohave County (Ariz).

Groundwater is the main water supply in the semiarid Hualapai and Sacramento Valleys in Mohave County in northwestern Arizona. The valleys are intermontane basins, which are filled to depths of more than 4,000 feet with alluvial deposits and volcanic rocks. The estimated volume of groundwater in storage to a maximum depth of 1,500 feet below land surface is 10.5-21 million acre-feet in Hualapai Valley ahout 3,600 feet proceedings of the process of the surface in Sacramento Valley. About 3,600 feet process of the surface in Sacramento Valley About 3,600 feet process of the surface in Sacramento Valley About 3,600 feet process of the surface in Sacramento Valley About 3,600 feet process of the surface in Sacramento Valley About 3,600 feet process of the surface in Sacramento Valley About 3,600 feet process of the surface lion acre-feet in Sacramento Valley. About 3,600 acre-feet of water was pumped from wells in Hualapai Valley in 1967, and about 4,200 acre-feet was pumped from wells in Sacramento Valley. Subsurface outflow is about 5,000 and 4,000 acrefeet per year from Hualapai and Sacramento Valleys, respectively. Water levels have remained almost constant in most of the area, but annual declines of as much as 7 feet have occurred in areas of large withdrawals. Groundwater in the valleys is generally of good chemical quality, but in highly mineralized areas in and near the mountains, the groundwater is unfit for human con-sumption. (Woodard-USGS)

### 4C. Effects on Water of Man's Non-Water Activities

SNOWMELT DELAY BY OVERSNOW TRAVEL, State Univ. of New York, Scotia. Atmospheric

Sciences Research Center. A. W. Hogan.

Water Resources Research, Vol 8, No 1, p 174-175, February 1972. 2 fig.

Descriptors: \*Winter sports, \*Snow management, \*Snowpacks, \*Snowmelt, Erosion control, Runoff, Soil conservation, New York. Identifiers: \*Snowmobiles, Snowmobiling

Oversnow vehicles compact the snowpack several inches as a result of their passage; drifting snow tends to refill these tracks to ambient level. This repeated travel and drifting result in storage of much greater water content in the snowmobile trails than in the adjacent undisturbed snowpack. From preliminary experiments, travel by over-snow vehicles appears to have, in years of heavy snowfall, two beneficial effects: (1) increased infiltration where the water content has been inased in disturbed snow, and (2) delay of snow melt on erosion-prone logging roads until after maximum runoff has occurred. The area chosen for study was an abandoned farm with an eleva tion of 700-1100 feet msl near the confluence of the Schoharie and Mohawk valleys. The area is quite hilly, and the rather steep slopes face north or east. Of the four sites selected for study, three were along the most traveled trail: (1) at a nearly level portion of an unshaded field, (2) on a northeast slope at a partially shaded portion of the same field, and (3) on a hardwood-lined abandoned road with a north-facing slope 50 meters southwest from site 2 at nearly the same elevation. The fourth site, at a north-facing slope on an abandoned logging road 100 meters southeast of site 2, was much less frequently used. (Knapp-USGS) W72-05340

THE EFFECT OF SHELTERWOOD FELLINGS ON THE CHANGE IN THE PHYTOCLIMATE

L. A. Kairyukshtis, and A. I. Yuodval'kis. Lesovedenie. 6. 21-27. 1969. English summary Identifiers: Broad-leaved, Climate, Fellings, Freezing, Light, Phyto, Precipitation, Shelterwood, Soil, Spruce-G, Stands, Temperature, Trees, Velocity, Wind.

Data of 11-year investigations on the climatic effects in spruce-broad-leaved stands subjected to shelterwood fellings of various intensities are described. Data are given on the changes in illumination, air and son temperatures, wind velocity, amount of summer and winter precipitation, depth of soil freezing and depth of ground water.--Copyright 1971, Biological Abstracts, Inc. W72-05398

ENVIRONMENTAL QUALITY: THE SECOND ANNUAL REPORT OF THE COUNCIL ON EN-VIRONMENTAL QUALITY, AUGUST 1971. Council on Environmental Quality, Washington, D.C.

For primary bibliographic entry see Field 05G. W72-05520

PREURBANIZATION RECONNAISSANCE STUDY OF LAKE EARL, DEL NORTE COUN-TY, CALIFORNIA, Geological Survey, Menlo Park, Calif.

For primary bibliographic entry see Field 02H. W72-05646

EFFECTS OF URBANIZATION ON WATER QUALITY,
Mississippi State Univ., State College. Dept. of
Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-05656

THE FORMATION AND DYNAMICS OF RUNOFF IN FORESTS AND CLEAR FELLING SITES IN KARELIA, (IN RUSSIAN),

A. A. Kuchko. Lesovedenie. 6. 37-44. 1969. English summary. Identifiers: Dynamics, Felling, Forests, Forma-tion, Horizon, Illuvial, Karelia, Light, Loamy, Podzolic, Runoff, Season, Sites, Soil, Spruce-G, USSR, Vaccinium-Myrtillus-D.

Results are given of 2-yr-observations on the for-mation and the course of superficial (intralitter) and intrasoil (along the illuvial horizon) runoff under a middle-aged Vaccinium myrtillus spruce forest canopy and on a 6-yr-old extensive clear felling site on podzolic light loamy soils with a poor water-permeable illuvial horizon of shallow occurrence. The intrasoil runoff preceded superfioccurrence. In intrasou runoit preceded superri-cial runoff; the latter appeared only after forma-tion of leakage water and its rise to the ground sur-face. In the spring with a protracted period of snowmelt and in the fall, no superficial runoff was observed. The runoff on the felling site started much earlier (10-41 days) in the spring as well as in the fall, lasted longer (by 20-60 days) and was 4-10 times as abundant as under the forest canopy. The increased runoff on extensive clear felling sites in Karelia was observed for 8-10 yr. The difference in the runoff between the forest and the felling site is noticeable even after the canopy closure of the young stand on the felling site.—Copyright 1971, Biological Abstracts, Inc. W72-05722

EFFECTS OF URBANIZATION ON TIMING OF FLOOD PEAKS ON TOWN CREEK IN JACKSON, MISSISSIPPI, Geological Survey, Jackson, Miss. Water

Resources Div. B. E. Wasson.

Geological Survey Open-file Report, 1972. 3 p, 3 fig. 1 tab. 3 ref.

Descriptors: \*Urbanization, \*Floods, \*Effects, \*Storm runoff, \*Mississippi, Peak discharge, Time of concentration, Flow characteristics, Hydraulic properties, Hydrographs, Precipitation (Atmospheric), Watershed management.

Identifiers: \*Urban hydrology, Town Creek (Miss).

The abnormal sequence of flood peaks observed during two low-order floods on Town Creek in Jackson, Miss. is attributed to spot urbanization. Flooding after general rains in March and April 1969 crested at downtown Gallatin Street before crests occurred at upstream measuring sites. Heavy urbanization in the downstream part of the basin caused an abnormal flood-peak sequence. Flood flow at Gallatin Street is spread over a greater time span than flows in the lightly urbanized area upstream in the northwest parts of the city. Rapid runoff from the lower heavily ur-banized part of the basin flows past the gage before runoff from the lightly urbanized parts of the basin arrives. This is described as a desynchronization of flood crests from different part of the stream basin. During floods caused by rainfall of longer duration than those described the effects of nonuniform urbanization probably will be less pronounced. (Lang-USGS) W72-05841

### 4D. Watershed Protection

SYSTEM AND METHOD FOR PREVENTING EROSION.

R. W. Hakundy. U. S. Patent No. 3,625,010, 3 p, 2 fig, 4 ref. Official Gazette, Vol. 893, No. 1, p. 53, December 7, 1971.

Descriptors: \*Patents, Erosion, \*Embankments, \*Shore protection, \*Bank erosion, \*Erosion control, Wave action, Lakes, Rivers, Drainage, Surface water, Tiles, Water management.

A means to prevent erosion of embankments along a lake or river frontage is described. A shallow ex-cavation about nine feet wide is dug in the ground along the top of the embankment, spaced back from the embankment edge. A trench deeper than the excavation is dug along the rearmost side of the excavation remote from the edge of the embankment. The bottom of the excavation is sloped gently in the direction of the trench and a water impervious plastic sheet is laid covering the bot-tom. Drain tile is placed in the bottom of the trench and covered with granular material. The excavation and trench are covered with topsoil. Water soaking into the soil close to the embankment is

### Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

### **Group 4D—Watershed Protection**

drained away and collected by the tile. (Sinha-OFIS) W72-05316

HYDROLOGICAL, HYDRAULIC, MECHANICAL AND METEOROLOGICAL ASPECTS OF MODELS DEVISED FOR DETER-MINING THE DEGREE OF PROTECTION OF-FERED BY FLOOD LEVEES.

National Water Authority, Budapest (Hungary). For primary bibliographic entry see Field 02A. W72-05332

## WEATHER MODIFICATION IN WATERSHED

MANAGEMENT, Fresno State Coll. Foundation, Calif. Atmospheric Water Resources Research.

For primary bibliographic entry see Field 03B. W72-05489

EFFECT OF CORN STEEP LIQUOR FOR ERO-AND CONTROL VEGETATIVE ESTABLISHMENT ON HIGHWAY BACKSLOPES.

Ohio Agricultural Research and Development

Center, Wooster.
B. L. Schmidt, G. S. Taylor, and R. W. Miller. Agronomy Journal, Vol. 61, p 214-217, March-April, 1969. 2 fig, 4 tab, 7 ref.

Descriptors: \*Erosion control, \*Evaporation control, \*Erosion, Slope protection, Bank stability, Soil stabilization, Soil moisture, Highways, \*Vegetation establishment.

Identifiers: \*Corn steep liquor, \*Mulch, \*Highway seeding.

Various concentrations of a corn steep liquor slurry were compared with straw mulch for erosion control and vegetative establishment on highway backslope plots. Applications of 5 and 10% corn steep liquor slurry followed immediately with lime slurry formed a thin, stabilized surface layer that resisted initial erosion on backslope plots after seeding. However, plant growth, cover, and erosion control over a growing season were the greatest under straw mulch, with no significant differences noted from the various corn steep liquor treatments by the end of the season. Growth chamber studies showed corn steep liquor slurry concentrations of over 10% solids applied at 1.4 liters/m2 retarded emergence of tall fescue seedlings up to 1 week. Soil moisture evaporation losses in a greenhouse study were not significantly affected by various rates of corn steep liquor application, but were greatly decreased by straw mulch. (Skogerboe-Colorado State) W72-05698

### A BILL TO AMEND THE WATERSHED PRO-TECTION AND FLOOD PREVENTION ACT, AS

For primary bibliographic entry see Field 06E. W72-05752

THE STANFORD MODEL APPLIED TO PIED-MONT WATERSHEDS, Clemson Univ., South Carolina. Dept. of Agricul-

tural Engineering. For primary bibliographic entry see Field 02A. W72-05860

### EXPERIMENTAL INVESTIGATION OF SMALL WATERSHED FLOODS, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 02E. W72-05873

### 05. WATER QUALITY MANAGEMENT AND PROTECTION

### 5A. Identification of Pollutants

DIELDRIN IN WATER - A BIBLIOGRAPHY. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

For primary bibliographic entry see Field 05B. W72-05325

SPECTROGRAPHIC DETERMINATION OF TRACE ELEMENTS (HEAVY METALS) IN WATERS (SPEK-TROGRAFICHESKOYE OPREDELENIYE
MIKROELEMENTOV (TVAZHELYKH METALLOV) V PRIRODYNKH VODAKH),
Gidrokhimicheskii Institut, Novocherkassk (USSR). V. Ya. Yeremenko.

Gidrometeoizdat, Leningrad, 1969. 110 p.

Descriptors: \*Spectroscopy, \*Water chemistry, \*Water analysis, \*Trace elements, \*Heavy metals, Inorganic compounds, Aluminum, Cobalt, Copper, Molybdenum, Titanium, Iron, Manganese, Organic matter, Sorption, Solubility, Chemical precipitation, Water pollution, Analytical control of the compound of the cal techniques, Instrumentation.
Identifiers: \*USSR, Natural waters, River waters,

Reagents, Nickel, Silver, Vanadium, Tin, Bismuth, Lead.

This handbook on a spectrographic determination of trace elements is a revised and expanded edition of the original text published in 1960 and is devoted to a determination of microgram quantities of heavy metals and aluminum in natural waters. The heavy metals considered are Ni, Co, Ag, Cu, V, Sn, Mo, Ti, Bi, Fe, Pb, and Mn. Preparation of water samples for spectral analysis and concentration of these trace elements by correcipitation and extraction are examined in the light of up-to-date techniques for semiquantitative and quantitative determinations of the metals in natural waters polluted by organic substances, nickel, iron, manganese, and aluminum. The text is designed for use by hydrochemists and other specialists engaged in a study of trace elements in natural water bodies. (Josefson-USGS) W72-05356

UPTAKE OF 137CS IN SOME MARINE ANIMALS IN RELATION TO TEMPERATURE, SALINITY, WEIGHT AND MOULTING, Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research. For primary bibliographic entry see Field 05B. W72-05405

CHARACTERISTICS OF E. COLI ISOLATED FROM DRINKING WATER AND THEIR SANI-TARY SIGNIFICANCE, V. E. Voronkin, and A. Y. Shtein.

Gig Sanit. 35 (8): 108-109. 1970. Identifiers: Drinking, Escherichia-Coli, Human, Isolated, Sanitary,

Analysis of 2351 drinking water samples showed coli titers of less than 300 in 172 cases, including 29 strains of Escherichia coli communae, 9 strains of E. coli communae mixed with other E. coli, 30 strains of E. coli citrovorum, 6 strains of E. coli aerogenes, and 84 strains of paracolon bacilli. In 13 cases a mixture of E. coli citrovorum, aerogenes and paracoli was found. The deviation from established standards for drinking water (22.6%) may be attributed to E. coli communae, the balance to other E. coli.--Copyright 1971, Biological Abstracts, Inc.

W72-05413

PHOSPHATE ANALYSIS.

Scripps Institution of Oceanography, La Jolla, Calif.

Available from the National Technical Informa-tion Service as COM-71-01021, \$3.00 in paper copy, \$0.95 in microfiche. Marine Technician's Handbook, SIO Reference No. 71-10, Sea Grant Publication No. 11, May 1, 1971. 17 p. NOAA-71082514

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Descriptors: \*Phosphates, \*Spectrophotometry, Turbidity, Sea water, Analytical techniques. Identifiers: \*Standard methods.

A method for analysis of phosphates in seawater employs a 'mixed reagent' containing sulfuric acid, ascorbic acid, ammonium molybdate, and trivalent antimony which is added to a 50 ml sample of water. A phosphomolybdate complex is formed which is reduced to give a blue solution. A spectrophotometer is used to measure absorbance in a 10 cm cell at 885 millimicrons against distilled water. A method of turbidity measurement, where necessary, is also described. It may be necessary to filter turbid samples before treatment with the reagent. (Mortland-Batelle) W72-05420

AQUATIC AND MARINE MICROORGANISMS, INTERRELATIONSHIPS IN ENRICHMENT CULTURES, Washington Univ., Seattle. Dept. of Microbiology.

For primary bibliographic entry see Field 05C. W72-05421

DETECTION OF OIL CONTAMINATION IN SEA WATER. VOLUME III: ENGINEERING EVALUATION AND IMPROVEMENT OF THE INFRARED OLEOMETER,

INFRARED OLEOMETER, IIT Research Inst., Chicago, III. G. L. Johnson, L. Townsend, and J. Stockham. Available from the National Technical Informa-tion Service as COM-71-00935, \$3.00 in paper copy, \$0.95 in microfiche. IITRI-C6065-66, July 1971. 51 p, 10 fig, 1 tab, 5 ref. IITRI Project No. C6065, Contr. No. MA-3854.

Descriptors: \*Oil, \*Sea water, \*Monitoring, \*Spectrometers, Infrared radiation, Oily water, Electronic equipment, Automation, Instrumenta-

Identifiers: Infrared spectrophotometry, ter, Methylene, Oleometer, Hydrocarbons, Photodiodes, Infrared absorbance.

An infrared oleometer, which was developed earlier for the monitoring of the oil content of water discharged from ships, has been evaluated for detecting oil contamination of sea water. Oil is detected by differential observations of infrared abtected by differential observations of infrared as-sorption at three wavelengths: 1.193, 1.211, and 1.229 microns. Absorption at 1.211 is due to methylene groups present in hydrocarbons and is compared to that at the other two wavelengths. The comparison of wavelengths is made by a special chopper acting as a modulator to deliver a balanced output to two detectors for common mode rejection of several sources of error and an unbalanced output in the presence of oil. The field evaluation demonstrated that the ratio of infrared optical effects of non-oily particulate matter to those of oils is too large to permit reliable cancella-tion of interference by simple, direct, fixed design, and choice of components. A 'matched pair' of lead sulfide detectors used in the instrument probably will not remain matched to the extent required. This could be altered by a breakthrough in the detectivity of room-temperature germanium photodiodes and improved stability of silicon photodiodes. Otherwise development of a relatively inexpensive (\$2500), reliable, remote monitoring station is not presently feasible. (Mortland-Bat-W72-05422

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### Identification of Pollutants-Group 5A

SOME RELATIONS BETWEEN ZOOPLANK-TON AND BUNKER C OIL IN CHEDABUCTO BAY FOLLOWING THE WRECK OF THE

TANKER ARROW,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 05C. W72-05424

MACROZOOPLANKTON AND SMALL NEK-TON IN THE COASTAL WATERS OFF VAN-COUVER ISLAND (CANADA) AND WASHING-TON, SPRING AND FALL OF 1963, National Marine Fisheries Service, Washington,

For primary bibliographic entry see Field 05C. W72-05426

O. I. Joensuu.

MERCURY-VAPOR DETECTOR, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.

Descriptors: \*Heavy metals, \*Chemical analysis, \*Water analysis, \*Sediments, Rocks, Coals, Spectrophotometry, Instrumentation, Gold, Analytical techniques, Organic matter, Laboratory equip-

rectiniques, Oganic matter, Laboratory equip-ment, Separation techniques. Identifiers: \*Chemical interference, \*Mercury, \*Atomic absorption spectrophotometry, Amal-gam, Detection limits, Biological samples.

An inexpensive mercury-vapor detector is especially suited for analysis of mercury in samples of sediments, rocks, coal, tissues, and water. The system consists of an atomic-absorption spectrophotometer having a mercury discharge lamp for the light source, a vacuum pump, and sample furnaces of quartz tubing. One furnace is filled with silver wire, and another with gold coils. The mercury vapor from treating the sample at 700 degrees C is amalgamated on the gold. Nitrogen passes through the furnace that contains the mercury, and the gases and mercury pass into the mea-suring chamber, which has been calibrated using known quantities of mercury. The pressure of mercury saturation at the measured temperature can be converted to weight 'of mercury per volume. For samples containing large amounts of organic matter, carbon (over 1 mg), sulfur, oxygen or air must be used in place of the nitrogen carrier. In water or acid solutions, mercury is reduced with stannous chloride and aerated out. When the instrument is clean, free from leaks and mercury absorbing deposits, and in good working condition, the recovery is better than 90 percent. The detection limit is 0.05 ppm in solution. (Jefferis-Battelle)

# TWO SIMPLE DURABLE EPIFAUNAL COL-

LECTORS, Laval Univ., Quebec. Departement de Biologie.

E. Bourget, and G. Lacroix.

Journal of the Fisheries Research Board of Canada, Vol. 28, No. 8, p 1205-1207, August 1971. 3 fig. 1 tab. 5 ref.

Descriptors: \*Benthos, \*Sampling, \*Sessile algae, \*Invertebrates, St. Lawrence River, Algae, Nematodes, Gastropods, Mollusks, Amphipoda,

Mechanical equipment.
Identifiers: \*Vertical collectors, \*Horizontal collectors, Bryozoans, Foraminifera, Hydroids, Polychaeta, Ostracods, Harpacticoids, Cirripedia,

Two types of epifaunal samplers (vertical and horizontal) for use in the infralittoral zone were developed and evaluated at four stations in the St. Lawrence estuary. The vertical sampler consisted of an iron pedestal with a projecting arm designed to hold 12 plywood collection panels. The arm was constructed to allow it to rotate to offer minimal resistance to the water flow and avoid toppling the structure. The horizontal sampler consisted of a box-like frame of iron with a hinged top to which 16 collection panels were attached. Both samplers were designed for easy removal of the sample panels by a scuba diver. No buoys were attached directly to the samplers so that algal collections on mooring lines would not interfere with the sam-ples. Evaluation of the two types of samplers showed that the vertical sampler is more suitable for study of epibenthic communities since it draws a wider range of species. The horizontal sampler, on the other hand, collected a larger number of specimens and is concluded to be preferable if only sessile and sedimentary organisms are to be studied. For complete sampling of the epifauna, use of both samplers is recommended. (Jefferis-Battelle) W72-05432

### BACTERIAL COUNTS OF COMMERCIAL FISH

DIETS, Victoria Univ. (British Columbia). Dept. of Bacteriology and Biochemistry. For primary bibliographic entry see Field 05B. W72-05433

#### GEL FILTRATION OF SURFACTANTS, Shionogi Research Lab., Osaka (Japan).

T. Nakagawa, and H. Jizomoto.

Journal of the American Oil Chemists' Society, Vol. 48, No. 10, p 571-577, October 1971. 6 fig, 10

Descriptors: \*Surfactants, \*Simulation analysis, Filtration, Monomolecular films, Model studies, Ions, Computer models, Detergents, Aqueous solutions.

Identifiers: \*Gel filtration chromatography, Elution, Micelles, Thin layer chromatography.

Through the use of an electronic computer, a simulation technique for analyzing the gel filtra-tion chromatography of surfactants has been developed. The technique is outlined and the theoretical and experimental elution curves are compared and discussed for five systems: (1) a surfactant of a single component; (2) an ionic surfactant in the presence of an electrolyte; (3) a mixture of two nonionic surfactants; (4) a mixture of two ionic surfactants; (5) a mixture of an ionic and a nonionic surfactant. In the first four systems, good agreement was found between the theoretical and experimental elution curves. Disagreement between the curves for system 5 apparently resulted from failure to account for some reaction effects in the simulation model. The experimental procedure for system 5 alone is described. (Holoman-Battelle) W72-05435

### DETERMINATION OF CARBON-12, CARBON--13 ISOTOPIC ABUNDANCES AND NITROGEN/CARBON RATIOS IN BIOLOGI-CAL SUBSTANCES BY PROTON-REACTION ANALYSIS, Oak Ridge National Lab., Tenn.

E. Ricci.

Analytical Chemistry, Vol. 43, No. 13, p 1866-1871, November 1971. 4 fig, 4 tab, 13 ref.

Descriptors: \*Tracers, \*Carbon radioisotopes, Radioactivity techniques, E. coli, Gamma rays, Ureas, Freeze drying.

Identifiers: Nitrogen radioisotopes, Proton-reaction analysis, Gamma spectrometry, Benzamide, Graphite, Biological samples, Mass spectrometry, Nuclear magnetic resonance, Lung, Brain, Sample

Proton bombardment in conjunction with gamma spectrometry has been successfully applied to the measurement of carbon and nitrogen isotopic ratios in biological materials. The method allows rapid determinations in biomedical and environ-mental carbon-13 tracer studies; this stable isotope provides an interesting alternative to carbon-14, whose use is limited by its radioactivity. Nitrogen-15 could be simultaneously determined. Thus the elemental ratio N/C, proportional to the isotopic ratio nitrogen-15/carbon-12 in natural biological samples, was also studied. Samples of human lung, brain, and Escherichia coli were analyzed inst urea, benzamide and graphite standards. Relative standard deviations were 4.8-8.6 percent and 4.8-9.0 percent for the determinations of carbon-13 isotopic abundances and of ratios N/C, respectively. Therefore, a 20 percent variation is observable and the method can, for example, determine an increase in the carbon-13 abundance from the natural 1.11 percent (average) to only 1.33 percent. An accuracy check of the carbon-13 determination--with reference to mass spectromet-ric 'true' results--gave a relative error of only -1.8 percent for proton reaction analysis. Ease and speed are important advantages of this technique over mass spectrometry and nuclear magnetic resonance, and its error is compatible with the natural variation of biological results. (Mortland-Battelle) W72-05436

# RADIOCHEMICAL DETERMINATION OF PLUTONIUM IN ENVIRONMENTAL AND BIOLOGICAL SAMPLES BY ION EXCHANGE, Western Environmental Research Lab., Las

Vegas, Nev. N. A. Talvitie.

Analytical Chemistry, Vol. 43, No. 13, p 1827-1830, November 1971. 4 tab, 10 ref.

Descriptors: \*Radiochemical analysis, \*Anion exchange, Ions, Aqueous solutions, Soils, Limestones, Spectrometers, Chromatography, Adsorption, Saline water, Fresh water, Bioassay, Urine, Volumetric analysis, Resins, Sea water, Fish, Uranium radioisotopes, Alkaline soils, Soils,

Soil analysis.

Identifiers: \*Plutonium, \*Biological samples, Siliceous soils, Air filters, Uranium, Polonium, Plutonium radioisotopes, Polonium radioisotopes, Sample preparation, Tissue, Bone, Plutonium-239.

An anion exchange method applicable to the routine determination of plutonium in environmental and biological samples is presented. Samples are initially prepared as azeotropic 6M hydrochloric acid solutions. Pu (IV), stabilized with hydrogen peroxide, is adsorbed on anionic resin from 9M hydrochloric acid solution. Coadsorbed iron is removed from the resin with 7.2M nitric acid. Plutonium is reductively eluted with 1.2M hydrochlo-ric acid-0.6 percent hydrogen peroxide and elec-trodeposited from 1M ammonium sulfate at pH 2 for alpha spectrometric determination. Sample preparation procedures are given for urine, animal tissue, bone, saline and nonsaline water, siliceous and limestone soil, and glass fiber air filters. Mean recoveries of Plutonium-236 internal tracer standard from the various types of samples were 83 to out from the various types of samples were as 102 percent with an overall mean of 94 percent. Minimum detectable activity for 1000-minute counts is 0.02 proton-Curie of Plutonium-239. (Holoman-Battelle) W72-05437

# ANAEROBIC ROLL TUBE MEDIA FOR NON-SELECTIVE ENUMERATION AND ISOLATION OF BACTERIA IN HUMAN FECES, Illinois Univ., Urbana. Dept. of Food Science; and

Illinois Univ., Urbana. Dept. of Dairy Science; and Illinois Univ., Urbana. Dept. of Microbiology. C. Eller, M. R. Crabill, and M. P. Bryant. Applied Microbiology, Vol. 22, No. 4, p 522-529, October 1971. 7 tab, 24 ref.

Descriptors: \*Anaerobic bacteria, \*Domestic wastes, \*Farm wastes, Cultures, Microorganisms, Isolation, Ruminants.

Identifiers: \*Nonselective enumeration, \*Nonselective isolation, \*Agars, Bacteroides ru-minicola, Bacteroides fragilis, Bacteroides oralis, Bacteroides melaninogenicus, Rumen bacteria.

Medium 10 (M10), developed for rumen bacteria and containing small amounts of sugars, starch, volatile fatty acids, hemin, Trypticase, yeast ex-tract, cysteine, and sulfide, plus agar, minerals

### **Group 5A—Identification of Pollutants**

and CO2-HCO3-buffer, was used with the Hungate anaerobic method as a basal medium to evaluate the efficacy of various ingredients. Three-dayold colony counts from adults on normal diets (17 samples) were 0.55 x 10 to the 11th power to 1.7 x 10 to the 11th power per g (mean, 1.15 x 10 to the 11th power) for M10. Single deletion of volatile fatty acids, Trypticase, yeast extract, or sulfide did not reduce counts. Deletion of hemin or both Trypticase and yeast extract significantly lowered percent dehydrated Brain Heart Infusion (BHI) or 2 to 6 percent liver infusion 2 counts. Addition of fecal extract, rumen fluid. 1 to 6 percent liver infusion did not increase counts; I percent dehydrated bile or 3.7 percent BHI markedly depressed them. Decreasing the gas-phase CO2 concentration from 100 to 5 percent with N2 and correspondingly lowering the HCO3 had little effect. Counts in supplemented Brewer Thioglycollate (Difco), BHI, and Trypticase soy agar were similar or lower than in M10; ease in counting was best in M10. Comparison of features of 88 predominant strains of fecal bacteria randomly isolated indicated that M10 supported growth of as many or more species of bacteria as compared to supplemented BHI. The results suggest that predominant bacteria of human feces, are not as nutritionally fastidious as rumen bacteria and indicate that media for counts or isolation containing large amounts of rich organic materials are neither necessary nor desirable when adequate anaerobic techniques are used. (Holoman-Battelle) W72-05438

'FINGERPRINTING' OF OIL BY INFRARED

SPECTROMETRY, Gulf General Atomic Inc., San Diego, Calif.

J. S. Mattson. Analytical Chemistry, Vol 43, No 13, p 1872-1873, November 1971. 4 tab, 4 ref.

Descriptors: \*Spectrophotometry, \*Oil, Neturon activation analysis, Aging (Physical), Water pollu-

tion sources, Water analysis. Identifiers: \*Infrared spectra, \*Oil spills, \*Oil characterization, Infrared spectrophotometry, Crude oil, Fuel oil.

Variations in the infrared spectra of oils from dif-ferent sources showed that infrared spectrophotometry is a promising method for characterizing oil spills. Forty oil samples were examined on a Hilger-Watts H-1200 spectrophotometer which recorded percent transmittance. The precision obtained with this system is about 1.7 per cm on the abcissa and 1 percent T on the ordinate. The recorded digital spectra were read directly into a Sigma 2 computer for automatic analysis and dis-play. The eight most characteristic of the 11 peaks observed were divided into eight equal incre-ments, which were numbered one to eight in order of increasing area. Intensity values were assigned to each of these incremental peaks. The eight character number thus obtained is the 'fingerprint' for that sample. Additional studies are being conducted on the effect of natural aging on the 'finger-print' and the extent to which this method of identification of oils can be applied. (Jefferis-Battelle) W72-05439

ELECTRON-DONOR-ACCEPTOR COMPLEX-ING REAGENTS FOR THE ANALYSIS OF PESTICIDES. I. SURVEY OF REAGENTS AND INSTRUMENTAL TECHNIQUES, National Research Council of Canada, Halifax

(Nova Scotia). Atlantic Regional Lab.

O. Hutzinger, W. D. Jamieson, J. D. MacNeil, and

Journal of the Association of Official Analytical Chemists, Vol 54, No 5, p 1100-1109, September 1971. 3 fig, 4 tab, 46 ref.

Descriptors: Analytical techniques, \*Spectroscopy, \*Chromatography, \*Pesticides, Metabolism, Molecular structure, DDT, Herbicides, Fluorescence, Organophosphorus pesticides,

Chlorinated hydrocarbon pesticides, Carbamate pesticides, Urea pesticides, Triazine pesticides, Fungicides, Chemical analysis, Spectrophotometry, Color.

Identifiers: \*Metabolites, Electron donors, Electron acceptors, Thin layer chromatography, Mass spectrometry, Mass spectra, Reflectance spectroscopy, Methoxychlor, pp'-DDT, Reagents.

The use of various complexing reagents as spray reagents for the detection of pesticides on thin layer plates, together with the use of in situ reflectance spectroscopy and mass spectrometry, provides a new approach to the detection, identification, and quantitation of pesticides. The complexes are generally highly colored thereby providing an additional aid in distinguishing between closely related pesticides and metabolites. The techniques discussed lack the sensitivity of methods such as esterase inhibition or fluorescence, but provide a high degree of selectivity for samples which may be separated at the microgram level or higher. The method of complexation and the instrumental techniques discussed could be useful to researchers involved in metabolic or structural studies. Applications of this method to various families or classes of pesticides and metabolites are currently under investigation. Sample mass spectra are included. (Holoman-Battelle) W72-05440

A COMPUTER-PROCESSED HIGH-PRECISION COMPLEXIMETRIC TITRATION FOR THE DETERMINATION OF THE TOTAL ALKALINE EARTH METAL CONCENTRATION IN SEA WATER,

Goteborg Univ. (Sweden). Dept. of Analytical Chemistry.

D. Jagner, and K. Aren.

Analytica Chimica Acta, Vol 57, No 1, p 185-192, November 1971. 2 fig, 2 tab, 10 ref.

Descriptors: \*Alkaline earth metals, \*Sea water, \*Volumetric analysis, Calcium, Magnesium, Spectroscopy, Computers, Photometry, Chelation, Salinity, Automation.

Identifiers: \*Photometric indicator titration, EDTA, Strontium, Flame emission spectroscopy, Atomic absorption spectrophotometry, Chelating agents, Eriochrome black T.

A high-precision computer-processed titration procedure for the photometric determination of the total alkaline earth metal concentration in sea water is described. Titrations were carried out at pH 10.5 with EDTA as the chelating agent and eriochrome black T as the indicator. The total concentration of the alkaline earth metals in Standard Sea Water of 3.5 percent salinity was determined with three different magnesium standards. A yield of 63.32 millimoles per kilogram was obtained for two of the three standards. This value agrees with a mean value of 63.41 obtained for different North Atlantic samples. The precision of the method is about 0.01 percent. (Holoman-Battelle) W72-05441

INTERIM DATA ACQUISITION SYSTEM FOR THE ENVIRONMENTAL TEST LABORATORY, Johns Hopkins Univ., Silver Spring, Md. Applied

For primary bibliographic entry see Field 07C. W72-05442

ACTIVATED SLUDGE ATP: EFFECTS OF EN-VIRONMENTAL STRESS, Florida Univ., Gainesville. Dept. of Environmen-

tal Engineering.
For primary bibliographic entry see Field 05D. W72-05443

INTEGRATED APPROACH TO PROBLEM OF

VIRUSES IN WATER, Federal Water Quality Administration, Concin-nati, Ohio. Advanced Waste Treatment Research

For primary bibliographic entry see Field 05F. W72-05444

A FEASIBILITY STUDY USING CONSERVA-TION WEBBING AS AN ARTIFICIAL SUB-STRATE IN MACROBENTHIC STUDIES, Virginia Commonwealth Univ., Richmond. Dept. of Biology. For primary bibliographic entry see Field 05C. W72-05464

'COLD VAPOR' METHOD FOR DETERMINING MERCURY.

National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
J. F. Kopp, M. C. Longbottom, and L. B. Lobring.
Journal of the American Water Works Association, Vol 64, No 1, p 20-25, January 1972. 1 fig, 5 tab, 18 ref.

Descriptors: \*Chemical analysis, \*Pollutant
\*Heavy metals, \*Analytical identification, "Heavy metals, "Analytical techniques, "Spectrophotometry, Water analysis, Instrumentation, Methodology, Laboratory tests, Pollutant identification, Reviews.

Identifiers: "Mercury determinations, "Coldvapor method.

Some forms of mercury are more insidious than others, and these forms are among the more difficult to analyze. The most popular method of analysis is the 'cold vapor' technique which is based on the absorption of radiation at 253.7 nm by mercury vapor. The procedure adopted by the Water Quality Office, EPA is described for the measurement of total mercury (inorganic and organic) in water samples. The range of the method may be extended either through recorder or instrument-scale expansion. Unless effluent samples are being analyzed, the range is adjusted to 0.02-0.05 micrograms of mercury per sample aliquot. With a 100 ml aliquot, this concentration corresponds to 0.2-5.0 micrograms per liter. Any atomic absorption unit having an open sample-presentation area in which to mount the absorption cell is suitable. (Woodard-USGS) W72-05490

MERCURY IN DRINKING-WATER SUPPLIES. Environmental Protection Agency, Washington, D.C. Office of Water Data. R. J. Hammerstrom, D. E. Hissong, F. C. Kopfler,

J. Mayer, and E. F. McFarren. Journal of the American Water Works Association, Vol 64, No 1, p 60-61, January 1972. 2 photo,

Descriptors: \*Water pollution sources, \*Heavy Descriptors: "Water pollution sources, "Heavy metals, "Potable water, "Pollutant identification, "Water supply, "Chemical analysis, Data collec-tions, Surveys, Sampling, Water analysis, Methodology, Laboratory tests, Trace elements, Public health. Identifiers: \*Mercury, Drinking water, U.S.A

Results of the EPA Division of Water Hygiene's analyses for mercury in 698 samples of raw and finished waters collected from 273 drinking water supplies throughout the United States indicate no health hazard, but show a need for continuing surveillance. Of the 273 community, recreationalarea, and federal installation water supplies examined, 261 showed either no detectable quantities of mercury or concentrations of less than 0.001 ppm in the raw and finished waters. In 11 of the water supplies, the mercury concentration ranged from 0.0010 ppm to 0.0048 ppm. One of several samples collected from a large community water supply exceeded the tentative standard of 0.005 ppm. (Woodard-USGS) W72-05491

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Identification of Pollutants—Group 5A

NEW, SIMPLIFIED METHODS FOR METAL ANALYSIS,

Environmental Protection Agency, Cincinnati, Ohio. Div. of Water Hygiene.

Journal of the American Water Works Association, Vol 64, No 1, p 28-31, January 1972. 4 fig, 13 ref.

Descriptors: \*Chemical analysis, \*Pollutant identification, \*Analytical techniques, \*Spectrophotometry, \*Metals, Water analysis, Flame photometry, Methodology, Instrumentation, Heavy metals, Laboratory tests.

Identifiers: \*Atomic absorption spectrophotometry.

Although it is generally true that atomic absorption spectrophotometry is far simpler and quicker than wet chemical methods, it is not true that all metals can be run in exactly the same way or without some difficulty. Metals such as zinc, copper, iron, magnesium, manganese, silver, cobalt, nickel, cadmium, and chromium can be determined by direct aspiration of the sample into an air-acetylene flame. Lead, however, must first be chelated with ammonium pyrrolidine dithiocarbamate and extracted into methyl isobutyl ketone. Aluminum, beryllium, barium, and vanadium require the use of the higher-temperature nitrous oxide acetylene flame to dissociate their molecules and to obtain the desired sensitivity. Mercury is best determined by use of a cold-vapor (flameless) technique, whereby all the mercury in a 100-ml sample is first oxidized to inorganic mercury, then reduced to metallic mercury, and finally volatilized by aeration and passed through an absorption tube placed in the light path of the atomic absorp-tion spectrophotometer. Arsenic is similarly determined by converting all the arsenic in a 50-ml sample to arsine and then sweeping the gas into an argon-hydrogen flame. (Woodard-USGS) W72-05493

PRELIMINARY INVESTIGATION OF MERCU-RY-HAZARD POTENTIAL, WARM SPRINGS DAM AND LAKE SONOMA PROJECT, DRY CREEK BASIN, SONOMA COUNTY, CALIFOR-NIA.

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 05B. W72-05495

INVESTIGATION OF FOAM AS A MEANS OF DETECTING SMALL CONCENTRATIONS OF MINERAL AND ORGANIC SUBSTANCES IN NATURAL WATERS (ISSLEDOVANIYE PENY KAK METOD OBNARUZHENIYA MINERAL'NYKH I ORGANICHESKIKH VESHCHESTY, SODERZHASHCHIK HSYA V PRIRODNYKH VODAKH V MALYKH KOLICHESTVAKH),

VODAKH V MALYKH KOLICHESTVAKH), Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.

For primary bibliographic entry see Field 02K. W72-05506

COMPOSITION OF ORGANIC MATTER IN BOTTOM SEDIMENTS OF THE BLACK SEA (OSOBENNOSTI SOSTAVA ORGANICHESKOGO VESHCHESTVA GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA), MOSCOW State Univ. (USSR).

Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02J.
W72-05508

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THE SYSTEM APPROACH TO SIGNAL CONDITIONING.

TIONING, Edgerton, Germeshausen and Grier, Inc., Albuquerque, N. Mex.

For primary bibliographic entry see Field 07B.

MECHANIZED EXTRACTION AND CLEANUP OF ATRAZINE RESIDUES IN SOIL PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS, California Univ., Riverside. Dept. of Entomology.

D. E. Ott, G. Formica, G. F. Liebig, Jr., D. O. Eberle, and F. A. Gunther.

Journal of the Association of Official Analytical Chemists, Vol. 54, No. 6, p 1388-1395, November 1971. 4 fig, 1 tab, 6 ref.

Descriptors: \*Gas chromatography, \*Pesticide residues, \*Soil analysis, \*Automation, Herbicides, Pesticides, Chromatography, Chemical analysis, Soils, Sampling, Automatic control, Analytical techniques, Separation techniques, Instrumentation, Laboratory equipment.

Identifiers: \*Atrazine, Detection limits, Cleanup,

Identifiers: \*Atrazine, Detection limits, Cleanup, Chemical recovery.

A mechanized method for assaying Atrazine residues in soil employs a Solidprep sampler for manipulating the soil samples and Technicon equipment for extraction and cleanup prior to analysis by nitrogen detector gas chromatography. Manually sieved and weighed soil samples are mechanically presented at a maximum rate of 6 per hour to this system, which delivers cleaned-up solvent extracts of the samples at the same rate to a fraction collector. Adjustment of final solvent volume in collection vessels and gas chromatography are performed manually, but analyses are done with an automated instrument. Atrazine residues in soils can be determined down to a lower limit of 0.05 ppm. The mean mechanized recovery values are 86-90 percent. A manual method involving refluxing showed slightly better extraction and could possibly improve the accuracy of the mechanized method. Since the system provides minimal cleanup, the gas chromatograph and other apparatus must be thoroughly and frequently cleaned. The method is suitable as a rapid screening tool for atrazine residues in soil. The mechanized method is capable of as much precision as manual methods. (Jefferis-Battelle) W72-05584

DETERMINATION OF RESIDUES OF CAR-BOFURAN AND ITS TOXIC METABOLITES BY ELECTRON CAPTURE GAS CHROMATOR RAPHY AFTER DERIVATIVE FORMATION, Agricultural Research Service, Yakima, Wash.

Entomology Research Div.

L. I. Butter, and L. M. McDonough. Journal of the Association of Official Analytical Chemists, Vol. 54, No. 6, p 1357-1360, November 1971. 1 fig. 2 tab, 5 ref.

Descriptors: \*Carbamate pesticides, \*Plants, Pesticide residues, Nematocides, Toxicity, Gaschromatography, Analytical techniques, Phenols, Separation techniques, Potatoes, Lettuce, Tomatoes, Soils, Chemical analysis, Pesticides. Identifiers: \*Carbofuran, \*Metabolites, \*3-hydroxycarbofuran, \*3-ketocarbofuran, Electron capture gas chromatography, Cabbage, Trichloracetates, Cucumbers, Chemical interference, Cleanup, Chemical recovery, Biological samples.

An electron capture gas liquid chromatographic method for the determination of carbofuran and its toxic metabolites, 3-hydroxycarbofuran and 3-ketocarbofuran, is based on the Butler and McDonough trichloroacetylation procedure and the extraction method of Cook, Stanovich and Cassil. Samples of cucumbers, lettuce, potatoes, tomatoes, tomato foliage, and soil were extracted with 0.25 N HCl, partitioned into dichloromethane and chromatographed on alumina. The carbamate residues were converted to trichloroacetates and chromatographed. The potentially interfering phenols were separated from the carbamates during cleanup by liquid chromatography. The recoveries, as tabulated, ranged from 67.2 to 139.5 percent with most recoveries being in the range of 80 to 100 percent. The sensitivity level of 3-hydroxycarbofuran was 0.04 and 0.01 ppm. respectively; since 3-ketocarbofuran occurs in

negligible quantities, it was not necessary to make any determination. (Holoman-Battelle) W72-05586

COLORIMETRIC DETERMINATION OF ANILINE DERIVATIVES IN NATURAL WATERS,

National Research Centre, Cairo (Egypt). Water Pollution Dept. M. A. El-Dib.

Journal of the Association of Official Analytical Chemists, Vol. 54, No. 6, p 1383-1387, November 1971. 2 fig, 5 tab, 23 ref.

Descriptors: \*Colorimetry, \*Water analysis, Surface waters, Toxicity, Aromatic compounds, Phenols, Analytical techniques, Hydrogen ion concentration, Salinity, Color, Taste, Chemical analysis.

Identifiers: \*Hydroxy-azo dyes, \*Primary aromatic amines, \*Aniline derivatives, Aniline, Chloroaniline, Dichloroaniline, Methylaniline, Dimethylaniline, Nitroaniline, I-naphthylamine, Benzidine, Resorcinol, Azo dyes, Metachloroaniline, Para-chloroaniline, I-naphthol, Fenuron, Detection limits, Absorbance.

A rapid, direct, and sensitive colorimetric method has been proposed for the determination of aniline derivatives in surface waters. The method is based on diazotization of the primary aromatic amine and coupling with resorcinol or 1-naphthol. The hydroxy-azo dyes (aniline, chloro-, dichloro-, methyl-, dimethyl-, and nitroanilines, l-naphthylamine, and benzidine) utilized have considerably high absorptivities, rendering the method sensitive enough to determine anilines at 0.1 ppm. The effects of pH, saline constituents of waters, coupling phenols, and substituents on color intensity are discussed. Coefficients of variation ranged between 6 and 0.5, according to the nature of aniline derivative and the amount determined. Precision of the method is greatly increased when the amount of the existent aniline ranges between 40 and 100 micrograms. (Holoman-Battelle)

A COMPARISON STUDY OF DETECTION LIMITS USING FLAME-EMISSION SPECTROSCOPY WITH THE NITROUS OXIDE-ACETYLENE FLAME AND ATOMIC-ABSORPTION SPECTROSCOPY, Kentucky Univ., Lexington. Dept. of Chemistry.

Kentucky Univ., Lexington. Dept. of Chemistry. G. D. Christian, and F. J. Feldman. Applied Spectroscopy, Vol. 25, No. 6, p 660-663, 1971. 2 tab, 17 ref.

Descriptors: \*Chemical analysis, \*Trace elements, \*Heavy metals, Flame photometry, Instrumentation, Aluminum, Calcium, Cesium, Chromium, Cobalt, Copper, Gold, Iron, Magnesium, Manganese, Molybdenum, Potassium, Sodium, Titani-

Identifiers: \*Flame emission spectroscopy, \*Atomic absorption spectrophotometry, \*Detection limits, Arsenic, Boron, Barium, Beryllium, Bismuth, Cadmium, Cerium, Dysprosium, Erbium, Europium, Gallium, Gadolinium, Germanium, Hafnium, Mercury, Holium, Indium, Iridium, Lanthanum, Lithium, Lutetium, Niobium, Lead, Neodymium, Nickel, Osmium, Paladium, Praseodymium, Platinum, Rubidium, Rhenium, Rhodium, Ruthenium, Antimony, Scandium, Silicon, Silver, Samarium, Tin, Strontium, Tantalum, Terbium, Tellurium, Thorium, Thallium, Thulium, Uranium, Vanadium, Tungsten, Yttrium, Ytterbium, Zinc, Zirconium.

Relative detection limits for 68 elements were determined by flame-emission spectroscopy with a nitrous oxide-acetylene flame and by atomic absorption spectrophotometry. All emission-detection limits were determined in the absence of ionization suppressants so that direct comparison could be made with atomic-absorption measurements. Based on these studies, 27 elements show

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equal detectability by the two methods, 15 are more sensitive by flame emission, and 26 are more sensitive by atomic absorption. The two methods are complementary; where one is not sensitive, the other can be used. (Jefferis-Battelle) W72-05588

THE DETERMINATION OF IRON IN USED LUBRICATING OIL, United Aircraft Research Labs., East Hartford,

G. S. Golden.

Applied Spectroscopy, Vol. 25, No. 6, p 668-671, 1971. 5 tab, 19 ref.

Descriptors: \*Iron, \*Oil, \*Fluorescence, \*Spectroscopy, Analytical techniques, Lubricants, X-ray fluorescence, Aqueous solutions, Chemical analysis, Instrumentation, Heavy metals. Identifiers: Atomic absorption trophotometry, Emission spectrography.

Several variations of rotating disk-spark emission spectrography, atomic absorption, and x-ray fluorescence spectrometry have been used to analyze used gas turbine lubricating oil for iron. The results of the instrumental analyses were compared with those from a quantitative wet chemical generally occurred as particles I micron or less in diameter. Rotating-disk emission spectrography with a cobalt internal standard, atomic absorption spectrometry with a nitrous oxide-acetylene flame, and dispersive as well as non-dispersive xray fluorescence spectrometry were the most reliable methods for this type of analysis. (Little-Bat-W72-05589

THE ELECTRON CAPTURE DETECTOR--A NEW MODE OF OPERATION,

Reading Univ. (England). For primary bibliographic entry see Field 07B. W72-05590

ELIMINATION OF PHOSPHORUS INTER-FERENCE IN THE COLORIMETRIC DETER-MINATION OF SILICON IN BIOLOGICAL MATERIAL.

Dow Corning Corporate Center, Midland, Mich. Biomedical Research and Development.
M. E. Jankowiak, and R. R. LeVier.
Analytical Biochemistry, Vol. 44, p 462-472, 1971.
7 fig. 1 tab, 24 ref.

Descriptors: \*Phosphorus, \*Bioassay, Iron, Chemical precipitation, Urine, Colorimetry.
Identifiers: \*Silicon, \*Chemical interference,
\*Biological samples, Liver, Adrenal glands, Spleen, Kidneys, Muscle, Organic silicon com-

An interference-free modification of the sil-icomolybdate colorimetric method for the estimation of silicon in biological material is described. The samples are decomposed in hot acid and the silicon solubilized as sodium silicate in an alkali fusion. Phosphoris is precipitated as calcium triphosphate. Residual phosphorus is allowed to form a phosphomolybdate complex that can be 'bleached' with oxalic acid. About 2 micrograms Si/sample can be estimated reliably. Experiments are presented in which endogenous silicon and silicon derived from a copolymer of mixed cyclosiloxanes were estimated in rat tissues to demonstrate the utility of the method. (Jefferis-Battelle) W72-05591

A SYSTEMATIC STUDY OF THE QUANTITA-TIVE EFFECTS OF INSTRUMENT CONTROL ON ANALYTICAL PRECISION IN FLAME IONIZATION GAS CHROMATOGRAPHY, Coal Tar Research Association, Gomersal (En-

For primary bibliographic entry see Field 02K

W72-05592

A SENSITIVE METHOD FOR DETERMINA-TION OF CHROMIUM IN BIOLOGICAL MATERIALS,
Commonwealth Scientific and Industrial Research

Organization, Melbourne (Australia). Div. of Protein Chemistry. M. H. Davis, and V. B. Grossman. Analytical Biochemistry, Vol. 44, p 339-344, 1971.

1 fig, 2 tab, 10 ref.

Descriptors: \*Chromium, Bioassay, Separation techniques, Peptides, Absorption. Identifiers: Atomic absorption Atomic absorption Biological samples, Identifiers: spec trophotometry, Sample

A previously developed method for detecting chromium in biological samples has been developed further for determining nanomole amounts of peptides containing chromium. Biological samples containing up to 5 micrograms of chromium III were prepared by wet-ashing and oxidizing to chromium VI with a mixture of nitric, sulfuric, and perchloric acids. Chromium VI was extracted into 10 percent tributyl phosphate in extracted into 10 percent tributyl phosphate in methyl isobutyl ketone at 4 degrees C. The ketone extract was aspirated into the fuel-rich air-acetylene flame of a Varian-Techtron atomic abactivities that of a Varian-Techtron atomic absorption spectrophotometer (model AAS) and the absorption due to chromium was obtained at 357.9 nm. The sensitivity of the procedure was 0.016 micrograms per milliliter of chromium. (Holoman-Battelle) W72-05593

LOPEZ WATER SUPPLY PROJECT, Koebig and Koebig, Inc., Los Angeles, Calif. For primary bibliographic entry see Field 04A. W72-05594

INFECTIOUS PANCREATIC NECROSIS OF SALMONIDS IN ONTARIO, Guelph Univ. (Ontario). Dept. of Microbiology. For primary bibliographic entry see Field 05C. W72-05596

SAMPLING IMPROVEMENTS IN ATOMIC AB-SORPTION SPECTROSCOPY, Perkin-Elmer Corp., Norwalk, Conn. H. L. Kahn, and J. D. Kerber. Journal of the American Oil Chemists' Society, Vol. 48, No. 9, p 434-437, September 1971. 12 fig, 1

tab, 8 ref.

Descriptors: \*Sampling, \*Lipids, \*Milk, Iron, Sodium, Potassium, Alkaline earth metals, Calcium, Magnesium, Copper, Corrosion, Instrumenta-tion, Absorption, Chromium, Cobalt, Manganese, Heavy metals, Trace elements, Oil.

Identifiers: \*Atomic absorption spec-trophotometry, \*Edible oils, Lanthanum, Nebulizer, Graphite furnace, Strontium, Sample preparation, Detection limits, Silver, Aluminum, Arsenic, Bismuth, Cadmium, Iridium, Nickel, Lead, Selenium, Thallium, Zinc.

A variety of sample preparation methods are used for the atomic absorption spectroscopic analysis of oils, fats, milk, and other substances to determine sodium, potassium, calcium, magnesium, copper, and other metallic contents. The copper copper, and other metallic contents. The copper and iron content of milk can be determined directly without sample preparation. Two new devices are now available that have considerably improved sampling techniques. A corrosion re-sistant nebulizer, in which the sample uptake capillary and the nebulizer capillary are made of capinary and the neounzer capinary are made on one piece of tefton and which has an adjustable uptake rate, is used for highly acidified samples to prevent spurious results due to corrosion. The Graphite furnace, which has replaced the burner, can handle extremely small amounts of sample and detect extremely law layers (in the singersum detect extremely low levels (in the picogram range) of metallic elements. (Holoman-Battelle) W72-05597

CADMIUM POISONING IN FUNDULUS HETEROCLITUS (PISCES: CYPRINODON-TIDAE) AND OTHER MARINE ORGANISMS, National Marine Water Quality Lab., West Kingston, R. I. For primary bibliographic entry see Field 05C. W72-05599

METHYLMERCURY IN FRESHWATER AND MARINE FISHES IN NEW BRUNSWICK, IN THE BAY OF FUNDY, AND ON THE NOVA SCOTIA BANKS, Fisheries Research Board of Canada, St. Andrews

New Brunswick). Biological Station.
V. Zitko, B. J. Finlayson, D. J. Wildish, J. M.
Anderson, and A. C. Kohler.
Journal of the Fisheries Research Board of
Canada, Vol 28, No 9, p 1285-1291, September
1971. 2 fig, 4 tab, 24 ref.

Descriptors: \*Freshwater fish, \*Marine fish, \*Heavy metals, White perch, Yellow perch, Atlantic salmon, Brook trout, Pikes, Sunfishes, Eels, Bullheads, Shiners, Suckers, Lake trout, Toxicity, Gas chromatography, Lobsters, Sculpins, Freez-

ing. Identifiers: \*Methylmercury, American eel, Chain pickerel, Mercury.

The methylmercury content is reported for some freshwater fishes from New Brunswick, marine fishes from the Bay of Fundy and the Nova Scotia Banks, and two museum specimens caught in New Brunswick in 1924. Freshwater and marine fish taken from 16 sampling sites (June to September 1970) and 30 sites in July 1970, respectively, were frozen immediately and stored until analysis. One gram samples were analyzed by gas chromatog-raphy. The presence of methylmercury was confirmed in several samples on the basis of (1) reaction with silver sulfate, (2) thin-layer chromatography and (3) high resolution mass spectrophotometry. Duplicate analyses were run on samples with high methylmercury content. The American eel (Anguilla rostrata), chain pickerel (Esox niger), white perch (Morone americana) yellow perch (Perca flavescens), brook trout (Salvelinus fontinalis), and Atlantic salmon (Salmo salar) contained 0.07-2.08, 0.27-1.58, 0.75-1.07, 0.20-1.05, 0.08-0.13, and 0.09 ppm of methylmercury, expressed as mercury on wet weight basis, respectively. With only two exceptions, levels of ppm. Some of the freshwater sampling locations could be directly associated with an industrial activity in the area, whereas others suggested pollution by airborne mercury. However, the concentration of methylmercury in eels from a lake in New Brunswick did not change over a period of 46 years, indicating that elevated levels of mercury may in some instances reflect the natural situation. (Holoman-Battelle)

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AN IN SITU MOLECULAR OXYGEN PROFILER: A QUANTITATIVE EVALUATION OF PERFORMANCE,

National Marine Fisheries Service, Miami, Fla. Tropical Atlantic Biological Lab. J. W. VanLandingham, and M. W. Greene. Marine Technology Society Journal, Vol 5, No 4, p 11-23, July-August 1971. 12 fig, 3 tab, 17 ref.

Descriptors: \*Sampling, \*Chemical analysis, \*Water analysis, \*Dissolved oxygen, \*Dissolved oxygen analyzer, \*Profiles, \*Instrumentation, Sea water, Monitoring, Depth, Electrical equipment, Electrodes, Laboratory tests, Oxygen, Oceans, Salinity, Atlantic Ocean.

Identifiers: \*Ion selective electrodes, Winkler analysis, Molecular oxygen.

A deep submergence oxygen probe (Beckman Instruments, Inc. MINOS (trademark)-Dissolved Oxygen Monitor) consists of a gold cathode and a silver anode with a gelled KCl electrolyte. Molecular oxygen and water vapor pass through a thin plastic membrane to the gold cathode where the

### Identification of Pollutants—Group 5A

oxygen is reduced to hydroxyl ions. Simultaneous oxidation of the silver anode establishes a chemical cell whose internal resistance is inversely proportional to the partial pressure of the molecular oxygen. The signal obtained is amplified by three operational amplifiers and transmitted to a recorder. The sensor was tested at various depths in the Tongue of the Ocean and the results compared with those obtained from Winkler analysis of samples collected at the same time. Salinity and depth were also measured during the tests. Updepth were also measured during the tests. Up-traces and downtraces of oxygen content were recorded to depths of 1300 meters. Data from the uptraces and downtraces differed for some unex-plained reason. Comparison of results from the two analyses showed that 60 percent of the downtrace and 53 percent of the uptrace data agreed with Winkler analyses. However, when low valonity data were diminated the correspondence velocity data were eliminated, the correspondence was 80 percent and 67 percent, respectively. Further discussions show the limitations of the probe and the methods for most satisfactory operation. (Jefferis-Battelle) W72-05602

IDENTIFICATION OF THE DERIVATIVES EM-PLOYED IN THE CONFIRMATION OF DIEL-

DRIN RESIDUES, Department of Agriculture, Ottawa (Ontario).

Analytical Services Section.

A. S. Y. Chau, and W. P. Cochrane.

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Bulletin of Environmental Contamination and Toxicology, Vol 5, No 6, p 515-520, 1971. 1 fig, 16

Descriptors: \*Dieldrin, \*Pesticide residues, \*Nuclear magnetic resonance, Molecular structure, Chromatography, Colorimetry, Chemical

analysis.
Identifiers: \*Acetylation, Infrared spectra, NMR spectra, Thin layer chromatography, Infrared absorbances.

The structure and stereochemistry of products formed when dieldrin is reacted with acetic an-hydride and catalytic amounts of sulfuric acid were determined from their IR and NMR spectra. The reaction is important since it is used for the determination of dieldrin residues. Three structures were identified from the spectra. The main products, m.p. 204-205 degrees C, from the reac-tion displayed an IR absorption at 1760 per cm which was attributed to the acetate function. Elemental analysis agreed with the formula C16H14Cl6O4 and suggested that this compound contained two acetoxy groups. Structure II, m.p. 164 degrees C, was a gum from which no pure product could be isolated. Structure III, a diacetate, was an isomer of II. (Jefferis-Battelle) W72-05603

ANALYSIS OF PESTICIDES IN WATER USING SILICA GEL COLUMN CLEAN-UP, Iowa Univ., Iowa City. State Hygienic Lab.

Bulletin of Environmental Contamination and Toxicology, Vol 5, No 6, p 542-545, September/October 1971. 2 fig, 2 ref.

Descriptors: \*Pesticides, \*Chlorinated hydrocar-bon pesticides, \*Separation techniques, \*Silica, \*Water analysis, Water quality, Dieldrin, DDT, Aldrin, Heptachlor, Organophosphorus pesti-cides, Gels, Adsorption, Instrumentation, Rivers, Lowe, Meditorine.

Lowa, Monitoring.

Identifiers: \*Chemical interference, Lindane, DDD, DDE, Detection limits, Electron capture gas chromatography, Cleanup, Sample prepara-

A rapid and accurate method is described for removing interfering organic compounds from river waters prior to analysis for low levels of pesticides. The sample is concentrated in a miniature Kuderna-Danish apparatus, passed through a silica gel column, and extracted with hexane, then benzene. The two fractions contain the chlorinated

hydrocarbon pesticides. Determination is made with an electron capture gas chromatograph. The method gives complete recovery of the chlorinated hydrocarbon pesticides and is satisfactory for routine monitoring of these pesticides in low parts per trillion concentrations. More polar compounds, such as organophosphorous, remain on the silica and can be extracted and analyzed in a third fraction. (Jefferis-Battelle) W72-05605

DETERMINATION OF RESIDUAL FUEL OIL CONTAMINATION OF AQUATIC ANIMALS, Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.

Bulletin of Environmental Contamination and Toxicology, Vol 5, No 6, p 559-564, Sep-tember/October 1971. 1 fig, 1 tab, 15 ref.

Descriptors: \*Aquatic animals, \*Toxicity, \*Path of pollutants, Oil, Chromatography, Spectroscopy, Oysters, Carp, Atlantic salmon, Crabs, Lobsters, Mussels, Analytical techniques, Spectrophotometry, Fish, Bioassay, Separation techniques, Absorption

sters, Musseis, Analytical techniques, Spectrophotometry, Fish, Bioassay, Separation techniques, Absorption.
Identifiers: "Bunker C oil, Crassostrea virginica, Aequipecten irradians, Mytilus edulis, Tetraclita squamosa rubescens, Mitella polymerus, Flounders, Barnacles, Scallops, Petroleum products, Carcinogens, Aromatic hydrocarbons, Parr, Periwinkles, Aliphatic hydrocarbons, Hermit crab Starfish Sea unchin Spectrofluorometry. renwinkies, Aiphatic hydrocarbons, Hermit crab, Starfish, Sea urchin, Spectrofluorometry, Biological samples, Fuel oil, Oil residues, Cancer irroratus, Pagurus, Littorina, Asterias vulgaris, Strongylocentrotus, Mya arenaria, Salmo salar, Pseudopleuronectes, Homarus americanus, Fate

A simple spectrofluorometric method for the quantitative determination of heavy residual fuel oil (Bunker C) in aquatic animals is described. Hexane extracts of animal tissue with an absorbance not greater than 0.001 at 300 nm (1 cm cell) were analyzed and the maximum fluorescence emission spectrum of Bunker C oil at 360 nm was used to calculate the Bunker C oil concentration in the tissues. Tabular data are presented to verify the conclusion that aquatic animals do take up large quantities of Bunker C oil and distribute it throughout the tissues. This method determines only the fluorescent fraction of the oil and gives no data on the biologically inert aliphatic fraction. It is suitable for the determination of the general patterns of uptake, excretion and metabolism of Bunker C oil in aquatic animals. Further study is required to determine the fate of the oil in the animals and in the food chain. (Holoman-Battelle) W72-05606

PHOSPHORIMETRY OF CHLORO- AND NITRO-AROMATIC FUNGICIDES,
National Research Council of Canada, Halifax

National Research Council of Canada, Fiantax (Nova Scotia), Atlantic Regional Lab. M. Zander, and O. Hutzinger. Bulletin of Environmental Contamination and Toxicology, Vol. 5, No. 6, p. 565-568, September/October 1971. 1 tab, 13 ref.

Descriptors: \*Fluorescence, Pesticides, Fungicides, Fluorometry, Carbamate pesticides. Identifiers: \*Phosphorescence, \*Phosphorimetry, \*Chloro-aromatic fungicides, \*Phitro-aromatic fungicides, p-nitrophenol, Chloroneb, 1-chloro-2 4-dinitronaphthalene, Daconil 2787, DCNA, Dyrene, Binapacryl, Blastin, Chloranil, Chloroacetaldehyde-2 4-dinitrophenylhydrazon, Dichlone, 2 4-dinitrophenyl, Dinobuton, DNOC, HCB, Oryzon, PCNB, PCP, 2 3 5 6-tetrachloronitrobenzene, Tricamba.

temperature fluorescence phosphorescence properties of 19 chloro- and nitro-aromatic fungicides have been investigated. Fluorescence emission spectra were obtained with an Aminco-Bowman spectrophotofluorimeter and

the phosphorescence spectra with an Aminco-Keirs phosphoroscope. For these compounds phosphorescence seems a useful property for de-tection and quantitative determination in natural samples. (Holoman-Battelle)

THE USE OF OBLIQUE ILLUMINATION IN MICROSCOPIC OBSERVATIONS OF LIVING

PROTOZOA,
San Francisco State Coll., Calif. Dept. of Biology.
H. Wessenberg, and M. K. Reed.
The American Microscopical Society Transactions, Vol 90, No 4, p 449-457, October 1971. 11

Descriptors: \*Protozoa, Refractivity, Methodology, Microscopy, Analytical techniques, Laborato-

ry equipment. Identifiers: "Oblique illumination, Brightfield op-tics, Darkfield optics, Phase-contrast optics, Or-ganelles, Laboratory techniques, Optical systems.

A method for achieving oblique illumination for observing live protozoa utilizes brightfield optics and involves decentering the light beams. When living protozoa are illuminated with an oblique beam of light from one sector of the microscope condenser, surface details, and also internal details, appear to have a three-dimensional quality as a result of being illuminated on one side and shaded on the opposite side. Those organelles with refractive indices differing from that of the surrounding cytoplasm are revealed and appear either as convexities or concavities. Oblique illumination provides different information about the specimens being observed as do the brightfield, darkfield, and phase-contrast illuminations. (Holoman-Battelle) W72-05611

LABORATORIES WHICH CONDUCT LEAD ANALYSES ON BIOLOGIC SPECIMENS, Pennsylvania Dept. of Environmental Resources,

Harrisburg. Div. of Occupational Health.
D. T. Donovan, V. M. Vought, and A. B. Rakow.
Archives of Environmental Health, Vol 23, No 2, p 111-113, August 1971. 4 ref.

Descriptors: \*Bioassays, \*Urine, \*Laboratories, Chemical analysis, Pennsylvania, Performance, Analytical techniques, Laboratory tests, Toxicity,

Trace elements, Quality control.
Identifiers: \*Performance evaluation, \*Lead, \*Blood, Lead nitrate, Industrial safety, Biological

The Division of Occupational Health, Pennsylvania, has endeavored to facilitate compliance with its recommendations on controlling health hazards in industries processing lead by identifying and evaluating the performance of laboratories which conduct bioassays for lead. Blood and urine samples containing known quantities of lead nitrate were submitted to 267 laboratories for analysis and the results compared with the known values. The comparisons showed which laboratories were capable of conducting the analyses, and also enabled the Division to evaluate the efficacy of its recommendations for engineering control of hazardous processes. (Jefferis-Battelle) W72-05612

DISTRIBUTION OF THERMOPHILIC BAC-TERIA IN ARCTIC AND SUBARCTIC HABITATS,

Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 05B. W72-05618

VERTICAL DISTRIBUTION OF PHOTOSYNTHETIC PIGMENTS AND THE

### Group 5A—Identification of Pollutants

PENETRATION OF LIGHT IN MARINE SEDI-

Copenhagen Univ., Helsingoer (Denmark). Marine Biological Lab.

T. Fenchel, and B. J. Straarup.
Oikos, Vol. 22, No. 2, p 172-182, 1971. 12 fig, 22 ref.

Descriptors: \*Sediments, \*Light penetration, \*Distribution patterns, Pigments, Photosynthetic bacteria, Sands, Separation techniques, Spectrophotometry, Colorimetry, Phytoplankton, Diatoms, Light intensity, Estuaries, Primary Sulfur bacteria. productivity, Benthos, Cyanophyta.

Cyanopayia.

Identifiers: \*Photosynthetic pigments, Oresund sound, Phycocyanin, Chlorophyll a, Microalgae, Bacteriochlorophyll a, Cryptomonad pigment, Fluorescent microscopy, Denmark.

Methods for studying the vertical distribution of some photosynthetic pigments (chlorophyll a, bacteriochlorophyll a, phycocyanin and a water-soluble cryptomonad pigment) in marine sediments are described, and examples of their vertical distribution and of absolute counts of microalgae from various types of shallow water sediments are given. In all types of sediments many pigmented cells are found below the photic zone. Light penetration in different kinds of sediment was measured for white and colored light. In pigmentfree sand long waved light penetrates furthest; this is of significance for the photosynthetic bacteria which live deeper in the sediment than algae and utilize near-infrared light for photosynthesis. The photic zone of very fine sand is of half the thickness of that found in coarse sand. The percentage of light absorbed by the photosynthetic pigments was estimated to be less than 10-20 percent of the total incident light in rich localities, a low value compared to other plant communities. The amount of chlorophyll a per unit area of the photic zone of different sediments was estimated and found to be lower than estimates from other plant communities. (Holoman-Battelle) W72-05619

EARLY DEVELOPMENT AND CHROMOSOME NUMBER OF THE POLYCLAD FLATWORM EUPLANA GRACILIS,

National Marine Fisheries Service, Oxford, Md. Biological Lab.

The American Microscopical Society Transactions, Vol. 90, No. 4, p 457-463, October 1971. 3 fig, 17 ref.

Descriptors: \*Worms, \*Aquatic animals, \*Growth

stages, "Chromosomes, Life cycles, Oysters, Bioindicators, Systematics, Bioassay. Identifiers: Euplana gracilis, Polyclad flatworms, Notoplana humilis, Notoplana delicata, Pseudostylochus obscurus, Pseudostylochus elongatus, Stylochus ellipticus, Hoploplana inquilina, Eustylochus ellipticus, Planocera nebulosa, Planocera inquilina, Prothecereus vittatus, Turbellaria, Tred Avon River.

The life history of the polyclad flatworm Euplana gracilis has been studied. Adult specimens were collected by placing shells with raft-caught seed oysters from the Tred Avon River (Maryland) in beakers of standing sea water. The collected samples were later transferred to aerated sterile sea water. Fertile eggs were produced sporadically for several months and hatched into juveniles which resembled the adult when held at 21 degrees C and 1.5 percent salinity. Egg squashes were made using 10 percent aceto-orcein to determine the number of chromosomes present. The chromosome number of Euplana gracilis was determined to be 2n equals 18 which falls within the range 2n equals 12 to 2n equals 20 previously determined for 10 other species of polyclads. (Holoman-Battelle) W72-05620

ANALYSIS AT SEA,

Coast Guard, Washington, D.C. Applied Chemical Oceanography Branch. N. R. Andersen.

Industrial Research, Vol. 13, No. 8, p 34-37, Au-

Descriptors: \*Analytical techniques, \*Salinity, \*Sea water, \*Trace elements, \*Water analysis, \*Dissolved oxygen analyzers, Gas chromatography, Depth-area-duration analysis, Flame photometry, Water chemistry, Fluorometry, Sampling, Ion exchange, Dissolved oxygen, Depth, Nutrients, Nitrites, Nitrates, Silicates, Phosphates, Colorimetry, Monitoring, Automation, Water temperature, Electrodes, Ion selective electrodes.

Improvements in analytical methods which allow on-board analysis at sea are reviewed. Manual, automated, and instrumental methods for determinations of salinity, dissolved oxygen, nutrients (nitrites, nitrates, phosphates, silicates), temperature, and depth are discussed. These methods include chemical analysis, such as Winkler titration for DO, gas chromatography, flame emission, atomic absorption, fluorimetry, use of probes, and towing of a 'fish' for temperature and depth profiles. The methods are adaptable for use on riverbank and sationary platforms. (Jefferis-Bat-W72-05621

ANIMAL WASTE MANAGEMENT AND AS-SOCIATED ODOR CONTROL.

New York State Coll. of Agriculture, Ithaca For primary bibliographic entry see Field 05D. W72-05680

MEASUREMENT OF MANURE GASES BY GAS CHROMOTOGRAPHY, Illinois Univ., Urbana. Dept. of Agricultural En-

For primary bibliographic entry see Field 05D.

OLFACTORY MEASUREMENT OF ANIMAL

MANURE ODOR, Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05D. W72-05683

CONTROL OF ODORS THROUGH MANURE

MANAGEMENT, Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05D.

FAUNA OF THE U.S.S.R., TRICHOPTERA, LARVAE AND PUPAE OF ANNULIPALPIA, Akademiya Nauk SSSR, Leningrad.

Zoologicheskii Institut. S. G. Lepneva.

W72-05684

Russian Translation New Series No. 88, TT 70-50082, 1970, 643 p.

Descriptors: \*Caddisflies, \*Growth stages, \*Systematics, Larvae, Oxygen requirements, Water temperature, Light, Current (Water), Insect

The morphology of the larvae and pupae of the trichoptera of the USSR are described and their biology and life conditions reviewed. The description is based on the systematics of the group and is accompanied with keys for identification. (Mort-W72-05689

A COMPARISON OF SOME METHODS FOR TOTAL PHOSPHATE ANALYSES, National Inst. for Water Research, Pretoria (South

J. E. Harwood, R. A. Van Steenderen, and A. L. Kuhn.

Water Research, Vol 3, No 6, 1969, p 425-432. 3

Descriptors: \*Chemical analysis, Water pollution, Oxidation, \*Phosphates, Analytical techniques, Pollutant identification.

Identifiers: \*Orthophosphate, \*Hydrogen-peroxide method, \*Dry-ashing method.

Five methods for total phosphorus analysis have been tested on six solid and five liquid samples. The dry-ashing procedure using magnesium nitrate, although long, generally was more reproducible. All samples were readily oxidized by persulphate and hydrogen peroxide methods. These alternatives were considerably simpler than the dry-ashing method, and although less precise were preferable for routine analyses, due to their speed and simplicity. Of the latter two techniques, the peroxide was the quicker, especially with solid samples. (Skogerboe-Colorado State) W72-05699

PRELIMINARY SURVEY OF HEAT METAL CONTAMINATION OF CANADIAN FRESH-WATER FISH.

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 05C.

W72-05712

EXPERIENCE WITH A BACTERIAL INOCU-LUM FOR USE IN RESPIROMETRIC TESTS FOR OXYGEN DEMAND, Water Pollution Research Lab., Stevenage (En-

gland).
H. A. C. Montgomery, and Deirdre K. Gardiner.
Water Research, 5 (4): 147-163, 1971. Illus.
Identifiers: Bacteria, Industrial, Inoculum, Oxygen, Respiromet take, Wastewater. Respirometric, Temperature, Tests, Up-

A rapid, general test for waste waters, based on the O2 uptake during a few hours in the presence of a specially prepared inoculum was studied. The inoculum was obtained freshly by the aeration of settled sewage with organic additives, and was developed with the requirements of reproducibility, high activity, and low endogenous demand in mind. Preparation of the inoculum and its application were carried out at 30C in the presence of inorganic nutrients and 0.04 M phosphate buffer, pH 7. The concentration of inoculum applied was usually 100-400 mg l-1. The inoculum degraded a wide range of pure compounds in a few hours with good reproducibility. In substances of relatively low biodegradability, some degree of adaptation was obtained by growing the inoculum in the presence of the substance in question. The O2 uptake with settled sewage in 6 hr was usually about 60-70% of the BOD (biological O2 demand) and 30-40% of the COD (chemical O2 demand). Promising results were obtained in tests carried out with industrial waste waters .-- Copyright 1971, Biological Abstracts, Inc. W72-05719

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CRGRRW 24

THE USE OF TTC FOR MEASUREMENT OF ENZYMATIC ACTIVITY OF BACTERIA IN THE OXYGENOUS DECOMPOSITION OF OR-GANIC SUBSTANCES,
Polish Academy of Sciences, Gdansk. Inst. of

Hydraulic Research. Janina Schwabe-Nowak

Gaz Woda Tech Sanit. 44 (12): 394-399. 1970. Illus. Identifiers: Animal, Bacteria, Chloride, Decomposition, Enzymatic, Measurement, Microorganism, Mineralization, Organic, Oxygenous, Phenol, Pollution, Substances, Tetrazole.

Sources of Pollution—Group 5B

The determination of the concentration, degree of contamination, and the course of mineralization is possible. Differentiated complexes of microorgan-isms, having an animal-bacterial character, only slightly influence the enzymatic activity of the bacteria determined by means of the TTC (triphenoltetrazole chloride) method. Concentration of impurities in natural conditions is lower that used in this model. This method may be useful in treating contaminated surface waters.--Copyright 1971, Biological Abstracts, Inc. W72-05735

AGRICULTURAL RUNOFF - A BIBLIOG-

RAPHY.
Office of Water Resources Research, Washington,
D.C. Water Resources Scientific Information

For primary bibliographic entry see Field 05B.

AQUATIC PLANTS FROM MINNESOTA PART 1-CHEMICAL SURVEY, Minnesota Univ., Minneapolis. Water Resources

Research Center. For primary bibliographic entry see Field 02K.

### 5B. Sources of Pollution

W72-05877

DIELDRIN IN WATER - A BIBLIOGRAPHY. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Informa-Available from the National Technical Information Service as PB-207 339, \$3.00 in paper copy, \$0.95 in microfiche. Water Resources Scientific Information Center Report (WRSIC 72-202), January 1972. 144 p.

Descriptors: \*Dieldrin, \*Water pollution, \*Bibliographies, \*Abstracts, Data storage and retrieval, Digital computers, Publications, Organic pesticides, Water pollution sources, Biodegradation, Environmental effects, Poisons. Identifiers: Permuted indexing.

A compilation of 98 abstracts with full biblio-graphic details is presented for selected reports, journal articles, and various documents published mostly since 1967 on dieldrin in water. The bibliography is produced from a computerized information base containing 35,675 abstracts covering Selected Water Resources Abstracts journal through December 15, 1971 (Volume 4, Number 24). A significant descriptor index is given of representative weighted terms that best describe the information content of the abstracted items. A comprehensive index is also given that represents all descriptors and identifiers used to index the different papers in the bibliography. Abstract items are arranged in ascending WI Number sequence. (Lang-USGS) W72-05325 WRSIC Accession

DATA NEEDS FOR PREDICTING PROBLEMS CAUSED BY THE USE OF SUBSURFACE RESERVOIRS,

Geological Survey, Denver, Colo. Water Resources Div.

Water Resources Research, Vol 8, No 1, p 238-241, February 1972. 4 ref.

Descriptors: \*Injection wells, \*Water storage, \*Waste disposal, \*Water pollution control, Path of pollutants, Data collections, Hydrologic data, Hydrogeology, Water management (Applied). Identifiers: \*Waste disposal wells.

There is a trend toward the use of subsurface reservoirs for storing different fluids. Historically, studies were focused chiefly on the consequences

of the withdrawal of fluids. Projecting the chang-ing emphasis toward the broader use of storage capacity, problems arising from the injection of fluids should attain a similar significance. The injection of fluids with dissolved substances of kinds and in concentrations incompatible with the rocks can cause thermal and chemical stresses in addition to the more prosaic pressure stress. All three types of stress can produce changes: (1) in the reservoir, (2) of the land surface, and (3) of structures on the land surface. Subsidence, seismic response, water quality degradation, and plugging of the pore space are already recognized as undesirable consequences of withdrawal and in-jection. Earth scientists are not yet fully cognizant of the need to define such responses in the subsur-face quantitatively, and therefore planners cannot become fully aware of the total cost of various alternatives for using the subsurface. Research emphasis and data collection practices should be altered to answer successfully the new and more complex questions. (Knapp-USGS) W72-05350

GEOCHEMISTRY OF AQUEOUS DISPERSION HALOS OF MERCURY DEPOSITS AND MERCURY MIGRATION MODES IN GROUND WATER (GEOKHIMIYA VODNYKH OREOLOV RASSEYANIYA MESTOROZHDENIY RTUTU I FORMY YEYE MIGRATSII V PODZEMNYKH VODAKH),

All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR) G. A. Goleva.

In: Voprosy prikladnoy geokhimii, No 2; Iz-datel'stvo 'Nedra', Moscow, p 113-126, 1971. 3 fig, 7 tab, 8 ref.

Descriptors: \*Geochemistry, \*Water chemistry, \*Water types, \*Hydrogeology, \*Groundwater, Connate water, Mineral water, Thermal water, Al-Connate water, Mineral water, Inermal water, Al-kaline water, Organic matter, Inorganic com-pounds, Heavy metals, Ions, Solubility, Oxida-tion, Salinity, Salts, Brines, Sulfides, Chlorides. Identifiers: "USSR, "Mercury, "Dispersion halos, "Aureoles, "Ore deposits, Antimony, Zinc, Ar-seric Lodics Progrids." senic, Iodine, Bromine.

The geochemistry and formation of aqueous dispersion halos of mercury deposits in Central Asia, Dagestan, Donets Basin (Eastern Ukraine), and Transcarpathia are examined in terms of the migration modes of this element in groundwaters. Mercury is a stronger complex former than copper, zinc, or lead, and its occurrence in waters in the form of free Hg ions is highly unlikely. Mercury in natural waters forms extremely stable complex compounds with iodine, bromine, and chlorine ions, even at very low concentrations of these elements. Hg (0H)2 complexes are predominant in alkaline waters, although the solubility of these mercury complexes is very low. Mercury, antimony, copper, zinc, and arsenic are the basic hydrochemical indicators of oxidized mercury deposits. Mercury aqueous dispersion halos are weakly differentiated, small in size, and extremely difficult to interpret from the standpoint of their spatial relationship to ore bodies. Hydrochemical anomalies of mercury are located in the immediate vicinity of ore deposits and in areas of discharge of deep interstitial-vein waters. Complex mercury compounds with elements of the halogen group are the most stable inorganic modes of mercury migra-tion. Absence of data on thiosulfates precludes the possibility of determining mercury migration in groundwater in the form of thiosulfate complexes. Further detailed investigations of mercury migration modes in natural waters and especially of mercury metallo-organic complexes may lead to more extensive application of this element in future hydrogeochemical surveys. (Josefson-USGS) W72-05351

PRINCIPLES OF HYDROCHEMISTRY (OS-NOVY GIDROKHIMII), Institut. Gidrokhimicheskii Novocherkassk

For primary bibliographic entry see Field 05G. W72-05354

PICLORAM PERSISTENCE IN SEMIARID

RANGELAND SOILS AND WATER, Texas A and M Univ., College Station. C. J. Scifres, R. R. Hahn, J. Diaz Colon, and M. G. Merkle.

Weed Sci. 19 (4): 381-384. 1971. Illus. Identifiers: Arid, Herbicide, Picloram, Rangeland, Residues, Runoff, Soils.

Residues in soil, following application of 0.25 lb/A of 4-amino-3, 5, 6-trichloropicolinic acid (picloram) to semi-arid rangelands, usually were restricted to the top 12 in. for 60 days. Five ppb or restricted to the top 12 in. for 60 days. Five ppb of less picloram were detected below 12 in. at 120 to 180 days after application; but picloram usually dissipated from the soil profile within a year. More picloram was detected 5 mo. after application at 6 to 18 in. deep at the lower ends of plots with 3% slopes than in plots with 0, 1 or 2% slopes. Runoff water from plots with 0, 1 or 2% slopes. Runoff siopes than in piots with 0, 1 or 2% slopes. Runoff water from plots irrigated 10 days after treatment contained 17 ppb picloram. Irrigation or rainfall at 20, 30, or 45 days after picloram application resulted in less than 1 ppb picloram in runoff water. No more than 1 or 2 ppb picloram were detected after dilution of runoff water in large ponds.—Copyright 1971, Biological Abstracts, Inc. W72-05368

DISSIPATION OF PICLORAM FROM VEGETA-TION OF SEMIARID RANGELANDS, Texas A and M Univ., College Station. Dept. of

Range Science.
C. J. Scifres, R. R. Hahn, and M. G. Merkle.

Weed Sci. 19 (4): 329-332. 1971. Illus. Identifiers: Arid, Bouteloua-Gracilis-M, Buchloe-Dactyloides-M, Dissipation, Herbicides, Picloram, Quercus-Havardii-D, Rangelands, Vegetation.

About 25 ppm of 4-amino-3,5,6-trichloro-picolinic About 25 ppm of 4-amino-3,5,6-trichloro-picolinic acid (picloram) usually were detected on grass, prinarily buffalograss (Buchloe dactyloides (Nutt.) Engelm.) and blue grama (Boutelous gractiis Willd. ex HBK Lag ex Griffiths), immediately after application of 0.28 kg/ha picloram + 0.28 kg/ha (2,4,5-trichlorophenoxy)-acetic acid (2,4,5-T) in northwest Texas. Less than 1 ppm of victoram yearly was detected in creat tires 20 to picloram usually was detected in grass tissue 30 to 60 days after treatment. At 1 location, detectable picloram increased in grass tissue from 32 to 60 days after application. Increases of picloram in aerial grass tissue were attributed to root uptake during a flush of vegetative growth. Picloram dis-sipation from grasses was not affected by irriga-tion to run-off at 10, 20 or 30 days after applica-tion. Detectable picloram was reduced by 93% in herbaceous, broadleaf species by 30 days after application. Treated sandy shinnery oak (Quercus havardii Rydb.) leaves at the soil surface caused a slight increase of picloram in surface litter.--Copyright 1971, Biological Abstracts, Inc. W72-05371

DISSIPATION OF DICAMBA, PICLORAM, AND

ACROSS ACROSS ACROSS AS THE LORAM, AI 2,3,6-TBA ACROSS NEBRASKA, Nebraska Univ., Lincoln. Dept. of Agronomy. O. C. Burnside, G. A. Wicks, and C. R. Fenster. Weed Sci. 19 (4): 323-325. 1971. Identifiers: Benzoic-Acid, Dicamba, Dissipation, Clycine-Max-D, Nebraska, Phaseolus-Vulgaris-D, Picloram, Soil, Toxicity.

The dissipation and detoxification of 3.6-dichloroo-anisic acid (dicamba), 4-amino-3,5,6-trichloropicolinic acid (picloram), and 2,3,6-trichlorobenzoic acid (2.3.6-TBA) was followed for 6 vr at 3 locations across Nebraska. Herbicide persistence was determined by growing field bioassays of field beans (Phaseolus vulgaris L.) and soybeans (Glycine max (L.) Merr.). Picloram showed the greatest soil persistence, 2,3,6-TBA was interediate, and dicamba showed the least persistence across Nebraska. The residual phytotoxicity of picloram in soil was not necessarily depen-

### Group 5B-Sources of Pollution

dent upon rainfall but was greatest in the fine textured soil with higher organic matter content.--Copyright 1971, Biological Abstracts, Inc. W72-05372

UPTAKE OF 137CS IN SOME MARINE ANIMALS IN RELATION TO TEMPERATURE, SALINITY, WEIGHT AND MOULTING, Institut Rudjer Boskovic, Rovinj (Yugoslavia).

Center for Marine Research. Cedomil Lucu, and Olga Jelisavcic.

Int Rev Gesamten Hydrobiol. 55 (5): 783-796. 1970. Identifiers: Animals, Blennius, Carcinus-Mediterraneus, Cesium-137, Marine, Molting, Mytilus-Galloprovincialis, Relation, Salinity, Temperature, Uptake, Weight.

The untake of 137Cs in mussles (Mytilus galloprovincialis), the crab (Carcinus mediterraneus) and a fish (Blennius sp.) was investigated. In the crab, the biological half-life of 137Cs decreased 4-fold with a change of temperature from 10 to 20 deg C, but mussels showed no such decrease, and Blennius showed an increase. The biological halflife in lower salinities was prolonged in mussels (slower component) and crabs (only 1 component) 1.2 to 1.7-fold in comparison to 100% sea water, where the half-life is in the range of 20-30 hr. In the crabs and mussels the values of the concentration ratio at equilibrium increased in 75% sea water to 1.1 to 1.5-fold more than in 100% sea water. The comparable rise in 50% sea water was 1.6 to 1.8-fold and in 25% sea water it was 2.2 to 2.4-fold. There was little effect of salinity on Blennius. In juvenile crabs and mussels the trend of the in-crease of the concentration ratio of 137Cs in equilibrium was significant, as well as the increase in the uptake rate of 137Cs (slow component). Molted crabs showed a significant increase in the rate of 137Cs uptake .-- Copyright 1971, Biological Abstracts, Inc. W72-05405

RADIUM IN AQUATIC FOOD CHAINS: RADI-UM UPTAKE BY FRESH WATER ALGAE, Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.

For primary bibliographic entry see Field 05C. W72-05406

ON THE QUESTION OF EFFECTING GROUND WATER BY THE DEPOSITION OF SOLID RESIDUES,

VED WTZ Wasserversorgung und Abwasserbehandlung, Leipzig (East Germany). H.-U. Mollweide.

Z Gesamte Hyg Grenzgeb. 17 (4): 261-264. 1971 (English summary).

Identifiers: Deposition, Ground, Literature, Residues, Review, Solid.

To correctly assess how and to what degree water supply plants are endangered by waste in the form solid residual substances, the conditions prevailing in the deposits, and their effects on un-derground and ground water are reviewed. Literature available in this field is surveyed and conclusions concerning protective measures for water supply plants are drawn.--Copyright 1971, Biological Abstracts, Inc. W72-05409

THE EFFECT OF THE INSECTICIDE 'PINETOX' ON THE E. COLI AS A POLLUTION INDICATOR AND THE DETERMINATION OF THE BIODEGRADATION OF THE INSECTI-CIDE BY BIOLOGICAL TESTS,

Institutul de Igiena, Iasi (Rumania). Bakteriol. Lab. Kommunalhyg.

For primary bibliographic entry see Field 05C. W72-05412

HYPERTENSION AND DRINKING WATER CONSTITUENTS IN COLORADO, Oregon Univ., Portland, Medical School.

For primary bibliographic entry see Field 05F. W72-05414

ENVIRONMENTAL POLLUTION BY LEAD AND OTHER METALS.
Illinois Univ., Urbana, Graduate Coll.

1971. 62 P, 9 FIG, 3 TAB, 27 REF.

Descriptors: \*Heavy metals, \*Water pollution effects, Water pollution sources, Trace elements, Food chains, Toxicity, Plankton, Bacteria, Fish, Model studies, Soil, Watersheds (Basins), Sedi-ments, Sewage, Industrial wastes, Analytical

Identifiers: \*Lead, Transport, Daphnia magna, In-unsoria, Mercury, Cadmium, Arsenic, Auto emis-

The University of Illinois has organized an interdisciplinary research program on environmental pollution by lead and other heavy metals which will continue for an 18-month period. This report outlines the proposed research. Major studies will include the sources, distribution, transport, behavior, and effects of these pollutants in terrestial and aquatic ecosystems comprising a watershed. Behavior and effects will be studied in the soil-water-plant continuum and in the animal population. Biological effects will be observed at community, organism, organ, cellular, and subcel-lular levels. The economic and social impact of pollution by these elements will be considered. Primary emphasis in the study will be on lead because it is widely distributed as a result of automotive fuel consumption and since it is relatively immutable and reasonably simple to detect and measure. Mercury, cadmium, and arsenic will also be considered. (Mortland-Battelle) W72-05417

SELECTIVE SORPTION OF BACTERIA FROM SEAWATER.

Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 05C. W72-05428

BACTERIAL COUNTS OF COMMERCIAL FISH

DIETS, Victoria Univ. (British Columbia). Dept. of Bacteriology and Biochemistry. T. J. Trust.

Journal of the Fisheries Research Board of Canada, Vol. 28, No. 8, p 1185-1189, August 1971.

Descriptors: \*Fish diets, \*Coliforms, \*Enteric bacteria, \*Salmonella, \*Cultures, \*Water pollution sources, Food chains, Aerobic bacteria, Foods, Anaerobic bacteria, Clostridium, Streptococcus, Spores, Human diseases, Isolation, Path of pollu-

Identifiers: Psychrophilic bacteria, Thermophilic bacteria, Enterococcus, Most probable number test, Salmonella montevideo, Salmonella livingston, Salmonella anatum, Aeromonas liquefa-ciens, Aeromonas hydrophilia, Aeromonas salmonicida, Mycobacterium marinum, Streptococ-

Because of the importance of fish as vectors of human disease, an investigation was initiated to determine whether fish foods may be a source of bacteria and should consequently have microbiological tolerance limits applied to them. Samples from 47 bags of commercial fish food from 9 production lots were bacteriologically examined by viable counts, by most probable number estimates, by enrichment, and by additional tests described by Skerman. The total count of aerobic bacteria ranged from 1000 to 10 to the 7th power bacteria per gram of diet. The diets con-tained psychrophilic and thermophilic species and up to 10,00 aerobic and anaerobic spore-forming bacteria per gram. Enterococci and members of the Enterobacteriaceae, including species of Salmonella, were also present. Fluorescent pseudomonads were detected in 18 of the 47 samples tested. Proteolytic, amylolytic, lipolytic, and haemolytic organisms were present in measurable numbers. The total viable aerobic count did not numbers. The total viable across could tak also change markedly on storage of representative samples at 4,20, or 30 C. It is recommended that tests for certain 'indicator' organisms be applied to fish foods to ensure their safety. Pasteurization and improvement in sanitary conditions in processing plants are suggested as means of greatly reducing contamination by bacteria. (Jefferis-Battelle) W72-05433

'FINGERPRINTING' OF OIL BY INFRARED SPECTROMETRY, Gulf General Atomic Inc., San Diego, Calif.

For primary bibliographic entry see Field 05A. W72-05439

A MATHEMATICAL MODEL OF WATER QUALITY IN AN IMPOUNDMENT, Washington State Water Research Center, Pull-

Pio S. Lombardo.

MS thesis, June 1971. 129 p, 21 fig, 2 tab, 73 ref, append. OWRR B-023-WASH (3).

Descriptors: \*Water quality, \*Impoundments, \*Mathematical models, \*Computer programs, Phytoplankton, Zooplankton, Nitrates, Phosphates, Dissolved oxygen, Chlorophyll, Detritus, Eutrophication. Identifiers: Green Lake (Wash).

A mathematical model was devised to simulate characteristics of Green Lake, Washington. The quality parameters included temperature, phytoplankton growth, concentrations of nitrate nitrogen, phosphorus, dissolved oxygen, phytoand zooplankton, detritus, and chlorphyll a. Simulation of temperature and phytoplankton growth coincided with observed data. During most of the period, simulated values of DO, phosphorus, and nitrates were similar to observed values. The curves of chlorophyll a and zooplankton population exhibited the same shape as those of the re-ported data, but differed in magnitude. A short-coming of the model was the difference between the average daily simulated values and the ob-served instantaneous values. (Wilde-Wisconsin) W72-05454

INJECTION WELLS POSE A POTENTIAL

American Chemical Society, Washington, D.C. For primary bibliographic entry see Field 05G. W72-05461

OUTFALL SIMULATION EXPERIMENT IN LAKE ONTARIO.

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Waterloo Univ. (Ontario). For primary bibliographic entry see Field 05C. W72-05463

TRITIUM FALLOUT IN SOUTHERN AUSTRALIA AND ITS HYDROLOGIC IMPLICA-TIONS.

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.

For primary bibliographic entry see Field 02B. W72-05484

STEADY DISPERSION ACROSS AN INTER-

FACE IN A POROUS MEDIUM, Technische Hogeschool, Delft (Netherlands).

Journal of Hydrology, Vol 14, No 3/4, p 337-347, December 1971. 4 fig, 8 ref.

### Sources of Pollution—Group 5B

Descriptors: \*Dispersion, \*Mixing, \*Path of pollutants, \*Interfaces, \*Porous media, Groundwater movement, Saline water-freshwater interfaces, Flow, Density, Viscosity, Tracers, Saline water intrusion, Numerical analysis.

In two problems of steady dispersion across an interface, originally non-polluted fluid flowed parallel to the interface. This fluid is polluted by dispersion across the interface. A flushing effect exists when the polluted fluid on the other side of the interface is stationary. The flushing effect may lead to a reduction of the width of the dispersion zone. The analysis is approximate in the sense that it is assumed that the tracer distribution is discontinuous across the interface. As such a discontinuity is consistent with a discontinuous flow field the results may well be sufficiently accurate. (Knapp-USGS)

THE OCCURRENCE OF ETHYLENE IN ANAEROBIC SOIL,
Agricultural Research Council, Wantage (En-

Agricultural Research Council, Wantage (England). Letcome Lab. For primary bibliographic entry see Field 02G. W72-05488

MERCURY IN DRINKING-WATER SUPPLIES, Environmental Protection Agency, Washington, D.C. Office of Water Data. For primary bibliographic entry see Field 05A. W72-05491

PLANKTON ENUMERATION AND EVALUA-

TION, Portland Water Bureau, Oreg.

A. W. Smith.

Journal of the American Water Works Association, Vol 64, No 1, p 67-70, January 1972. 1 fig, 11 ref.

Descriptors: \*Water pollution sources, \*Water pollution control, \*Water pollution effects, \*Plankton, \*Water analysis, Water treatment, Data collections, Sampling, Testing, Aquatic life, Methodology, Analytical techniques, Water supply, Water quality, Chemical analysis, Evaluation.

The biological examination of water includes a qualitative and quantitative analysis of the various kinds of planktonic organisms that may be present in a water system. The information is important in judging the overall quality of a water system. This aspect of water-quality control is presented with a few of the problems and procedures used. Algae are frequently the primary cause of clogging of sand filters and screens in water-treatment plants. Coloration due to algae in finished water is most frequent in uncovered storage reservoirs in the distribution system or where the treatment of the raw-water supply is not efficient in reducing the number of phytoplankton. Water-quality control should include periodic inspections of the raw-water supply, treatment plant, and distribution system for algae growths. This procedure should be followed by a laboratory examination and recording of the dominant organisms in the samples taken at regular intervals at various sampling stations. (Woodard-USGS) W72-05492

PRELIMINARY INVESTIGATION OF MERCU-RY-HAZARD POTENTIAL, WARM SPRINGS DAM AND LAKE SONOMA PROJECT, DRY CREEK BASIN, SONOMA COUNTY, CALIFOR-NIA

Geological Survey, Menlo Park, Calif. W. G. Hines.

Geological Survey Open-file Report, November 8, 1971. 19 p, 4 fig, 2 tab, 9 ref, 3 append.

Descriptors: \*Water pollution sources, \*Pollutant identification, \*Heavy metals, \*Mine wastes, \*California, Hot springs, Reservoir sites, Pre-im-

poundment, Water quality, Sampling, Chemical analysis, Water analysis. Identifiers: \*Mercury, \*Sonoma County (Calif).

The multipurpose Warm Springs Dam and Lake Sonoma Project currently under construction by the U.S. Army Corps of Engineers, is located on Dry Creek in Sonoma County, California, approximately 14 miles above the Dry Creek-Russian River confluence. Three hot springs and an abandoned metacinnabar (mercury ore) mine are near the uninhabited resort village of Skaggs Springs, and will be inundated by water from Lake Sonoma sometime in 1975. Results of analyses of water samples taken in the Skaggs Springs area showed concentrations of mercury in the three hot springs and other local streams that ranged from <0.05 to 1.8 micrograms per liter. However, mercury concentrations of as much as 180,000 ppb were detected in algae and 55,000 ppb in sediments which were locally associated with the hot springs. These high concentrations are characteristic of the behavior of mercury in aquatic environments—the tendency being for mercury to concentrate in sediments, organic material, and aquatic life. Stagnant conditions in Lake Sonoma near the Skaggs Springs area could conceivably allow high mercury concentrations to accumulate in local sediments and aquatic life. (Woodard-USGS)

QUANTITATIVE DISTRIBUTION OF ZINC IN WATERS OF THE SEA OF AZOV (KOLICHESTVENNOYE RASPREDELENIYE TSINKA V VODE AZOVSKOGO MORYA), Institute of Biology of Southern Seas, Sevastopol

For primary bibliographic entry see Field 02K. W72-05503

BIOGENOUS SUBSTANCES IN DEEP WATERS OF THE CASPIAN SEA (BIOGENNYYE ELEMENTY V VODAKH GLUBOKOVODNOY CHASTI KASPIYSKOGO MORYA), State Oceanographic Inst. Moscow (USSR). For primary bibliographic entry see Field 02K. W72-05504

USE OF THE LUMINESCENT METHOD TO STUDY ORGANIC MATTER OF NATURAL AND POLLUTED RIVER WATERS (PRIMENENIYE LYUMINESTSENTNOGO METODA PRI IZUCHENII ORGANICHESKOGO VESHCHESTVA CHISTYKH I ZAGRYAZNENNYKH RECHNYKH VOD), Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.

For primary bibliographic entry see Field 02K. W72-05505

COMPARATIVE GEOCHEMICAL DESCRIPTION OF ORGANIC MATTER IN RECENT SEDIMENTS OF WESTERN AND EASTERN SLOPES OF THE SOUTHERN CASPIAN BASIN (SRAVNITEL'NAYA GEOKHIMICESKAYA KHARAKHERISTIKA ORGANICHESKOGO VESHCHESTVA SOVREMENNYKH OSADKOV ZAPADNOGO I VOSTOCHNOGO SKLONOV YUZHNO-KASPIYSKOY VPADINY), Azerbaidzhanskii Nauchno-Issledovatelsii Institut a Debusha Nofti: Reku (11859).

po Dobyche Nefti, Baku (USSR). For primary bibliographic entry see Field 02K. W72-05507

HYDROGEOLOGY OF SOLID WASTE DISPOSAL SITES IN NORTHEASTERN IL-LINOIS.

LINOIS, Illinois State Geological Survey, Urbana. G. M. Hughes, R. A. Landon, and R. N. Farvolden.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price \$1.50. Report SW-12d, U.S. Environmental Protection Agency, 1971. 154 p, 28 fig, 20 tab, 85 ref, 8 append.

Descriptors: "Hydrogeology, "Illinois, "Water quality, "Water pollution sources, "Groundwater, "Solid wastes, "Landfülls, Dissolved solids, Groundwater movement, Leaching. Identifiers: "Northeastern Illinois, "Solid waste disposal, Groundwater flow system.

Hydrogeologic and water quality studies of five landfills in northeastern Illinois were carried out over a four-year period. The distribution and concentration of dissolved solids in the vicinity of four of these landfills was controlled by the configuration of the ground-water flow system. The major factors influencing the attenuation of the dissolved solids after they have left the landfill appear to be the particle size of the earth materials through which these dissolved solids move and the distance that they move. Precipitation in northeastern Illinois is adequate to infiltrate a completed landfill and to leach the refuse. Where the natural environment is not capable of containing or assimilating this leachate the landfilling operation can probably be made safe by lining the disposal site, by collecting and treating the leachate or by other relatively simple engineering procedures. (Davis-Chicago) W72-05564

METHYLMERCURY IN FRESHWATER AND MARINE FISHES IN NEW BRUNSWICK, IN THE BAY OF FUNDY, AND ON THE NOVA SCOTTA BANKS.

SCOTIA BANKS, Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station. For primary bibliographic entry see Field 05A. W72-05601

MICROBIAL COMETABOLISM OF 2,4,5--TRICHLOROPHENOXYACETIC ACID, Bowling Green State Univ., Ohio. Dept. of Biolo-

gy. R. S. Horvath.

Bulletin of Environmental Contamination and Toxicology, Vol 5, No 6, p 537-541, 1971. 1 fig, 15 ref.

Descriptors: \*Metabolism, \*Chlorinated hydrocarbon pesticides, \*2 4 5-T, \*Chromatography, \*Pesticide removal, Microorganisms, Herbicides, Halogenated pesticides, Cultures, Degradation, Biodegradation, Analytical techniques, Pesticides, Respiration, Oxidation.

Identifiers: \*Brevibacterium, Arthrobacter, Thin layer chromatography, Metabolites, \*Cometabolism.

Cometabolism is the phenomenon by which a microorganism oxidizes a compound, though unable to utilize it as a source of carbon for growth. This process may account for the degradation of many pesticides in nature since bacteria have been found which dehalogenate pesticides. Brevibacterium, a nonphotosynthetic, nonsporing, gram positive rod which was mobile by a peritrichous flagella, cometabolized 2,4,5-T with the consumption of 1 micromole oxygen and the release of 1 micromole chlorine per micromole of herbicide oxidized. The product of the cometabolism was tentatively identified as 3,5-dichlorocatechol by thin layer chromatography. Prior to this no organism had been found which could effect a significant change in 2,4,5-T. Thus it was concluded that most, if not all, organic compounds can be degraded by complete mineralization of the molecule or by cometabolism if the right environmental conditions exist. (Jefferis-Battelle) W72-05604

ANALYSIS OF PESTICIDES IN WATER USING SILICA GEL COLUMN CLEAN-UP, Iowa Univ., Iowa City. State Hygienic Lab. For primary bibliographic entry see Field 05A.

### Group 5B—Sources of Pollution

DETERMINATION OF RESIDUAL FUEL OIL CONTAMINATION OF AQUATIC ANIMALS, Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station. For primary bibliographic entry see Field 05A W72-05606

EUTROPHICATION (THE AGEING OF LAKES), A FLORIDA WATER QUALITY PROBLEM.

Florida Dept. of Air and Water Pollution Control,

For primary bibliographic entry see Field 05C. W72-05607

ALGAL DISTRIBUTION IN SIX THERMAL SPRING EFFLUENTS.

Southeast Missouri State Coll., Cape Girardeau. Dept. of Biology. R. G. Kullberg.

The American Microscopical Society Transactions, Vol 90, No 4, p 412-434, October 1971. 9 fig, 6 tab. 20 ref.

Descriptors: \*Algae, \*Distribution \*Thermal springs, Cyanophyta, patterns, Alkalinity, Nutrients, Water quality, Diatoms, Chlorophyta, Thermal water, "Montana, Phosphates, Nitrates, Nitrites, Iron, Silicon, Sulfates, Sodium, Potassium, Calcium, Magnesium, Chlorides, Hydrogen ion concentration, Periphyton, Water tempera-

Identifiers: Alhambra Hot Springs, Boulder Hot Springs, Jackson Hot Springs, Lolo Hot Springs, Pipestone Hot Springs, Sleeping Child Hot

The distribution of algae was studied in six thermal springs of western Montana. Alhambra (north), 54.4 C; Alhambra (south) 48.0 C; Boulder, 61.3 C; Jackson, 61.5 C; Lolo, 46.0 C; Pipestone, 59.5 CP and Sleeping Child, 52.0 C. The blue-green algae (Myxophyceae) were the only algae near the sources of the streams. The mean maximum temperature endured by the diatoms (Bacillariophyceae) was 43.2 C; by the green algae (Chlorophyceae), 40.9 C. Presence lists of the algae along a temperature gradient indicate the order in which the algae appeared in the stream as the water cooled. The per cent volumes for the major and intermediate species were plotted along the temperature gradient to show the interactions among the populations of the continuum. The streams containing the greatest variations of habitats resulted in more erratic curves of several modes among the major populations and scattered occurrences among the intermediate species. Variations in types of habitats downstream promoted the relocation of translocated algal promoted the relocation of transforates again masses until overwhelmed by the previously established populations. Five new taxa are described: Chamaesiphon prescotti n. sp.; Pseu-danabaena oblonga n. sp.; Synechococcus lividus Copeland var. nanum n. var; Oscillatoria geminata Copeland var. fragilis forma breve n. forma; Oscillatoria geminata Copeland var. tenella forma minor n. forma. (Mortland-Battelle) W72-05610

THE USE OF OBLIQUE ILLUMINATION IN MICROSCOPIC OBSERVATIONS OF LIVING PROTOZOA,

San Francisco State Coll., Calif. Dept. of Biology. For primary bibliographic entry see Field 05A. W72-05611

POLLUTION: CHEMICAL POLYCHLORINATED BIPHENYLS, A. L. Hammond

Science, Vol 175, No 4018, p 155-156, January 14,

Descriptors: \*Polychlorinated biphenyls, \*Water pollution sources, \*Toxicity, \*Pesticides, Water pollution effects, Gas chromatography, Sewage, Fish, Coho Salmon, Great Lakes, Birds, Lake Trout, Bioassay, Human pathology, Animal pathology, Industrial wastes, Sunfishes, Cat-fishes, Shrimp, DDT, Analytical techniques, Or-ganophosphorus pesticides, Reviews. Identifiers: Dibenzofurans, Sweden, Japan, Synergistic effects, Lethal dosage.

Although polychlorinated biphenyls (PCBs) were never intended for release into the environment, they are now found in rivers, streams, lakes, in rainwater, in human tissue, and in many species of fish and birds. The sources of PCBs in the environment and their biological effects are reviewed. The major sources are believed to be sewage outfalls and industrial disposal into waterways. The presence and amount of PCBs is most commonly determined by gas chromatographic methods, but these methods are not specific for particular compounds. PCBs appear to be very persistent in the environment. Most birds and mammals appear to be relatively resistant to PCBs, but some fish species are very susceptible. Trout have died from ex-posure at 8 ppb and shrimp at doses as low as 1 ppb. PCBs interact with chlorinated pesticides and organophosphorus pesticides to increase their toxic effects. There is apparently much similarity between environmental effects of PCBs and those of DDT. (Mortland-Battelle) W72-05613

BIOLOGICAL DEGRADATION OF MINERAL OIL IN SEA WATER,

Koninlijke/Shell-Laboratorium, Amsterdam (Netherlands).

A. L. Bridie, and J. Bos. Journal of the Institute of Petroleum, Vol 57, No 557, p 270-277, September 1971. 4 fig, 4 4 tab, 12

Descriptors: \*Water purification, \*Biodegration, \*Oceans, \*Marine bacteria, \*Biochemical oxygen demand, Oil, Water quality, Nutrients, Water pollution sources, Oxidation, Phenols, Microorganisms, Water temperature, Sampling, Respiration, Carbon dioxide, Phosphorus, Nitrogen, Aging (Biological), Seawater, Water pollution effects. Identifiers: \*Mineral oil, North Sea, Crude oil, Glucose, Glutamic acid, Oleic acid, Kerosene, Sciedlas il Theoretical proposed activates. Spindle oil, Theoretical oxygen demand.

An attempt was made to resolve the question of whether mineral oil is degraded in sea water by conducting laboratory experiments on degradation rates of phenol, oleic acid, kerosene, spindle oil, and Kuwait crude oil. Using the ratio of BOD to TOD (theoretical oxygen demand), it was possible to determine the rate and time of complete degradation of the oils. The first biodegradation experiments were conducted on the oils in freshwater samples enriched with ammonia and phosphate and seeded with bacteria from activated sludge. It was found that phenol was most easily degraded followed in order by oleic acid, kerosene, spindle oil, and crude oil. To determine whether these bacteria can adapt to sea water conditions, biodegradation tests were conducted with phenol in synthetic sea water with added nutrient salts and acclimatized seed water from an activated sludge plant. Initially, degradation was much slower than in freshwater. However, after 5 days when the bacteria had adapted, the same amount of phenol was added and biodegradation proceeded at a rate nearly equal to that in freshwater, thus showing that the bacteria grow as easily in seawater. The final experiments were conducted with actual seawater from the North Sea Membrane filtration of several samples showed that none was sterile and bacteria counts ranged from 200-8,000 per ml. The oils were added to the samples, this time without bacterial seeding, and the rates of degradation were recorded. It was found that mineral oil is equally well degraded biologically in sea water and in fresh water and that the rate of degradation depends mainly on the availability of nitrogen and phosphorus-containing compounds, which elements control the growth of a bacterial population. As these compounds are indeed present in sea water, but in extremely low concentrations only, the natural purification process, in the case of oil, will take a relatively long time, probably many months. (Jefferis-Bat-telle) W72-05616

DISTRIBUTION OF THERMOPHILIC BACTERIA IN ARCTIC AND SUBARCTIC HABITATS, Colorado State Univ., Fort Collins. Dept. of

Microbiology. W. L. Boyd, and J. W. Boyd. Oikos, Vol 22, No 1, p 37-42, 1971. 1 fig, 4 tab, 17

Descriptors: \*Arctic, \*Soil contamination, \*Water pollution, \*Water quality, \*Subarctic, Alaska, Sampling, Spores, Sewage bacteria, Ecological distribution, Hot springs, Geographic regions, Climatic zones, Soil microorganisms, Bioindicators, Water pollution effects, Bacteria, Distribution pat-terns, Aquatic bacteria, Cultures. Identifiers: \*Thermophilic bacteria, Canada, Nor-

way, Psychrophilic bacteria, Agars, Feces.

Numerous soil and water samples from thirteen geographic regions of Alaska, one in northern Canada and seven in Norway were analyzed for thermophilic, mesophilic, and psychrophilic bacteria. Most of the areas sampled were above the Arctic Circle. Thermophilic bacteria were found to be widely distributed in Arctic and Subarctic areas but in low numbers. Hot springs and the higher surrounding soil temperatures may account for the higher number of thermophiles in Canada, but does not explain their occurrence in Norwegian soils. It appears that some soils have a natural flora composed of thermophiles, but there is also evidence that some thermophiles have their origin in sewage contamination. The role of thermophilic bacteria in the ecology of polar waters and soils is not now understood. (Jefferis-Battelle) W72-05618

ESTIMATING DISPERSION COEFFICIENTS IN ESTUARIES.

Oregon State Univ., Corvallis. Dept. of Civil Engineering. For primary bibliographic entry see Field 02L. W72-05623

PRESENT AND FUTURE SALINITY OF COLORADO RIVER,

Colorado River Board of California, Los Angeles. M. B. Holburt, and V. E. Valantine. M. B. Holourt, and v. E. valantine. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, HY3, Paper 8769, p 503-520, March 1972. 3 fig, 7 tab, 9 ref.

Descriptors: \*Water pollution sources, \*Colorado River, \*Salinity, Water resources development, Water pollution control, Withdrawal.

Under the impact of continually increasing demands on the water supply of the Colorado River, the river's already high salinity would increase by at least 50% at the major diversion points along the Lower Colorado River prior to the year 2000 un-less salinity control measures are instituted. The Colorado River is a major source for the seven states of the Pacific Southwest and projected economic growth in these states requires the nearly full utilization of the river's water by that date. Natural conditions of salinity are identified for the Colorado River basin. Salinity increase projections are based on consumptive use of water and the return of dissolved salts to the river system and on the addition of dissolved salts through the use of water for irrigation, municipal, industrial, and other purposes; on evaporation; and on out-of-basin diversions. Estimates of damages from increases in salinity are presented, together with suggestions for possible control measures. (Knapp-USGS) W72-05625 EFFLUENT EXPANSION AND INTERFACIAL MIXING IN THE PRESENCE OF A SALT WEDGE, MISSISSIPPI RIVER DELTA, Louisiana State Univ., Baton Rouge. Coastal Stu-

For primary bibliographic entry see Field 02L. W72-05648 dies Inst.

POLLUTION OF GROUNDWATER DUE TO

MUNICIPAL DUMPS, Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch. G. Hughes, J. J. Tremblay, H. Anger, and J.

Canada Department of Energy, Mines and Resources, Inland Waters Branch, Technical Bul-letin No 42, 1971. 98 p, 4 tab, 72 ref, 2 append.

Descriptors: \*Water pollution sources, \*Ground-water, \*Landfills, \*Garbage dumps, \*Municipal wastes, Reviews, Waste disposal, Cities, Waste dumps, Bibliographies. Identifiers: \*Urban hydrology, Canada.

Current literature on groundwater pollution due to municipal dumps is reviewed. Topics are: ground-water pollution by solid wastes: significant research in this field; regulations; criteria for site selection; safeguards; and observation, detection and identification of pollutants. Groundwater pollution from other sources and the basic problems that commonly arise in the development of a rational approach to solid-waste disposal are also reviewed. Two bibliographies of over 600 references are included. (Knapp-USGS)

NITRATE IN DEEP SOIL PROFILES IN RELA-

NITRATE IN DEEP SOIL PROFILES IN RELA-TION TO FERTILIZER RATES AND LEACHING VOLUME, California Univ., Riverside. Dept. of Soil Science. P. F. Pratt, W. W. Jones, and V. E. Hunsaker. Journal of Environmental Quality, Vol 1, No 1, p 97-102, January-March 1972. 5 fig, 6 tab, 8 ref. EPA, WQO Grant 16060 DOE.

Descriptors: \*Nitrates, \*Fertilizers, \*Leaching, \*Soil water movement, \*Path of pollutants, Groundwater movement, Denitrification, Unsatu-

The NO3 concentration in saturation extracts and soil solutions was determined in 30-m profiles in six treatments of a long-term fertility trial with citrus and in four commercial citrus groves in which the depth of sampling was 15 m or to the top of the water table. Drainage volumes and excess N in the soil, calculated as N input minus crop removal, provided a reasonable estimate of the N03 concentration of water in the unsaturated zone in open-porous soils when inputs were about 150 kg/ha per year. However, at higher rates of inputs to porous soils or at low rates with soils with profiles which had textural discontinuities, denitrification had to be assumed to obtain a reasonable N balance. Calculated transit times for water to move 30 m in the unsaturated zone varied from 12 to 49 years. (Knapp-USGS) W72-05655

THE EFFECTS OF URBANIZATION ON

WATER QUALITY,
Mississippi State Univ., State College. Dept. of Civil Engineering. E. C. McGriff, Jr.

Journal of Environmental Quality, Vol 1, No 1, p 86-89, January-March 1972. 19 ref.

Descriptors: \*Urbanization, \*Water quality, \*Water pollution sources, \*Water pollution effects, Water yield, Peak discharge, Recharge, Ifiltration, Storm runoff, Water temperature, Eutrophication, Cities, Sediment yield, Sedimen-Identifiers: \*Urban hydrology.

Urbanization increases the sediment load carried by streams, decreases groundwater recharge, promotes eutrophication, and causes temperature variation in streams, all of which tend to alter water quality. Urbanization increases the volume of runoff and the size of the flood peak, and decreases the lag time. Groundwater recharge is minimized, which reduces low flow augmentation and its dilution potential. The quality of urban runoff is a major factor in promoting the copious growth of plankton and algae. Stream temperatures increase during the summer and decrease during the winter, with reference to streams flow-ing through natural settings. Dissolved oxygen content tends to be critical during the low flow conditions found in the summer, and, since the solubility of oxygen decreases with an increase in the temperature, the effect of urban runoff on a stream is adverse. Urbanization can also have a pronounced effect on the quality of groundwater. (Knapp-USGS)
W72-05656

AIR CONTAINING NITROGEN-15 AMMONIA: FOLIAR ABSORPTION BY CORN SEEDLINGS. Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div. L. K. Porter, F. G. Viets, Jr., and G. L.

Hutchinson. Science, Vol 175, No 4023, p 759-761, February 18, 1972. 1 fig, 2 tab, 10 ref.

Descriptors: \*Nitrogen compounds, \*Air pollu-tion, \*Water pollution sources, \*Foliar applica-tion, Transpiration, Ammonia, Vegetation effects, Absorption, Greenhouses, Laboratory tests,

Amino acids, Growth chambers.

Identifiers: \*Ammonia sink (Atmosphere). Green

In quest of a cleaner environment, man is increasingly concerned about nitrogen compounds (oxides, ammonia, and amines) that are volatilized into the air and may be absorbed by water. Laboratory studies concerning foliar absorption by plants are described. Corn seedlings 30 days old, grown in the greenhouse with different concentrations of supplemental nitrate nitrogen were moved to a constant-temperature growth chamber and sealed in a 560-liter tent of polyvinyl chloride. The plants were exposed to air containing ammonia labeled with nitrogen-15 (1, 10, and 20 ppm) for 24 hr and then harvested. The nitrogen-15 content of the tops and roots showed that at 1 ppm 43% of the ammonia was absorbed, whereas at 10 and 20 ppm, 30% of the ammonia was absorbed. The results illustrate that growing plants are a sink for atmospheric NH3 and can absorb considerable quantities of NH3 from the air. Green plants, like rain, may cleanse the atmosphere of possible pol-lution by nitrogen compounds. (Lang-USGS) W72-05657

AN ECONOMIC ANALYSIS OF POULTRY PROCESSING WASTEWATER IN DELAWARE, Delaware Univ., Newark. Dept. of Agricultural and Food Economics.

B. L. Hudson, G. L. Cole, and R. C. Smith.

Agricultural Experiment Station, Bulletin 383,

December 1970. 18 p, 11 tab, 10 ref. OWRR B-003-DEL (2).

Descriptors: \*Waste water (Pollution), \*Waste water treatment, \*Poultry, \*Economics, Biochemical oxygen demand, Industries, Delaware, Effluents, Water pollution sources.

The amount of waste and wastewater created by Delaware's poultry processing plants is enormous: main effluent volumes range from one-quarter to one-half million gallons per day per plant. The un-recovered waste represents a cost since waste treatment must be provided in accordance with government regulations to prevent or abate pollution of Delaware's waterways. To determine the sources of waste, an effort was made to isolate and analyze effluents from five of Delaware's six processing plants. The operations analyzed in-cluded scalding, dressing, eviscerating, chilling, and main effluent. The study indicated that the highest volumes and per unit amounts of BOD and suspended solids were produced by the eviscerating operation. Evisceration produced almost three times as much wastewater and twice as much BOD as was produced in any other operation. Dressing was the second highest producer in all categories. Scalding and chilling produced roughly the same amounts of water. Average main effluent volumes per processed bird ranged from 3.2 to 8.2 gallons. There seemed to be some economies of scale involved in reducing per unit wastewater volumes since the wastewater per bird was found to be in-versely related to kill rate and plant size. (Settle-W72-05659

AN INVESTIGATION OF PRIMARY PRODUCTIVITY USING THE 14C METHOD AND AN ANALYSIS OF NUTRIENTS IN ELEPHANT BUTTE RESERVOIR,
New Mexico State Univ., University Park. Water

Resources Research Inst. For primary bibliographic entry see Field 05C. W72-05687

TRAVEL OF NITROGEN IN SOILS, Minnesota Univ., Minneapolis. Dept. of Civil En-

H. C. Preul, and G. J. Schroepfer. Journal Water Pollution Control Federation. Vol. 40, No. 1, p 30-48, January, 1968, 15 fig, 5 tab, 6

Descriptors: \*Adsorption, \*Nitrogen, Saturation, Soils, Nitrification, Soil physics, \*Soil chemistry, \*Path of pollutants, \*Soil contamination, Laboratory tests, Soil analysis.

Adsorption and biological action are the main controlling factors of the movement of nitrogen through soil. Physical adsorption inhibits the travel of NH4+-N, but is limited by the presence of other ions. Little inhibition of NO3-N occurs at other ions. Little infibition of NO3-N occurs at wastewater pH. Adsorption dominates and biological interference with NH4+ movement is minimal when oxygen is limited, e.g., when soil is saturated. Under well-aerated conditions, nearly complete nitrification occurs within a few feet of the influent surface. (Skogerboe-Colorado State) W72-05695

FREQUENCY OF ANIMAL BOTULISM OF WATER ORIGIN IN SENEGAL, (IN FRENCH), Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux, Fort-Lamy (Chad). For primary bibliographic entry see Field 05C. W72-05715

PYROPHOSPHATE HYDROLYSIS FLOODED SOIL, Texas A and M Univ., College Station. Dept. of

Soil and Crop Sciences.
L. R. Hossner, and D. P. Phillips.
Soil Sci Am Proc. 35 (3): 379-383, 1971. Illus Identifiers: Activation, Energy, Flooded, Hydrolysis, Phosphate, Pyro, Soil.

Rate of hydrolysis of pyrophosphate, applied as (NH4)3HP2O7. H2O, was measured under flooded and 1/3 atm moisture content. Hydrolysis was faster under flooded conditions than at 1/3 atm moisture. Pyrophosphate hydrolysis was determined to be a 1st-order reaction under flooded conditions but not at 1/3 atm moisture content. The 1st-order rate constants under flooded conditions ranged from 2.09 x 10-5 min-1 to 1.43 x 10-4 min-1 depending upon the soil and temperature of incubation. Half-life values for applied pyrophosphate varied from 0.6 to 3.9 days. The activation energy for pyrophosphate hydrolysis under flooded soil conditions was calculated to be 4,500 cal/mole for a Katy sl soil.--Copyright 1971, Biological Abstracts, Inc.

### Group 5B-Sources of Pollution

W72-05723

PHOSPHORUS DIFFUSION IN SOILS: I. THE EFFECT OF APPLIED P, CLAY CONTENT, AND WATER CONTENT,

AND WATER CUNIEST, Technology, Inc., Houston, Tex. Samuel K. Mahtab, Curtis L. Godfrey, Allen R. Swoboda, and Grant W. Thomas. Soil Sci Amer Proc. 35 (3): 393-397, 1971. Illus. Identifiers: Applied, Clay, Diffusion, Flow, Mass, Mineral, Movement, Phosphorus, Soils, Uptake.

Self-diffusion coefficients of 32P (D) were measured in Miller clay, Norwood loam, and 2 textural intergrades of these 2 soils. Clay percentages of the soils were: Norwood, 12.5; Intergrade I, 25.0; Intergrade II, 36.0; and Miller, 59.0. The P rates used were 0, 25, 50, and 100 ppm. The moisture levels were 35, 60, and 100% of the water content between 1/3 and 15 bars tension. The D values averaged over all clay and P levels, increased from 10.25 x 10-10 to 27.76 x 10-10 cm2/sec as the water content increased from 35 to 100% of the available moisture. The average D value increased from 5.05 x 10-10 for the Norwood to 26.59 x 10-10 cm2/sec for the Miller soil. Likewise, D values increased with increasing rates of added P for all soils. Reduction in available water has less effect on diffusion rates of P in clay soils than in the lighter-textured soils. In order to maintain a given rate of diffusion in a soil, as water content decreases, the amount of added P must be increased.—Copyright 1971, Biological Abstracts, Inc. W72-05725

TESTING SODIUM HAZARD PREDICTIONS, New Mexico State Univ., University Park. Dept. of Agronomy.

G. A. O'Connor.
Soil Sci Am Proc. 35 (3): 510-512, 1971.
Identifiers: Coefficient Equations Hazard

Soil Sci Am Proc. 33 (3): 310-312, 1971. Identifiers: Coefficient, Equations, Hazard, Irrigation, Leaching, Mineral, Predictions, Sodium, Soil, Testing, Weathering.

Greenhouse data were used to test a series of equations developed by Rhoades to predict the Na hazard of irrigation waters. Two equations used to calculate values of the leaching requirement (LR) needed to prevent excessive buildup of exchangeable sodium (LRSAR) were found to successfully predict excess Na accumulation in treatments where LF < LRSAR. Equations used to calculate SARdw (Na adsorption ratios of drainage waters) values gave good quantitative agreement for systems apparently in equilibrium when the soilmineral weathering coefficient was assumed to be 0.65.—Copyright 1971, Biological Abstracts, Inc. W72-05731

FEEDLOT POLLUTION SLIDE SHOW, Federal Water Pollution Control Administration, Kansas City, Mo. Missouri Basin Region. For primary bibliographic entry see Field 05G. W72-05812

ANIMAL WASTE POLLUTION - OVERVIEW OF THE PROBLEM,

Federal Water Pollution Control Administration, Kansas City, Mo. Missouri Basin Region. For primary bibliographic entry see Field 05G. W72-05813

INDUSTRY'S ROLE IN FEEDLOT POLLUTION CONTROL,
For primary bibliographic entry see Field 05G.

RESEARCH ON ABATEMENT OF POLLUTION AND MANAGEMENT OF ORGANIC WASTES FROM CATTLE FEEDLOTS IN NORTHEAST-ERN COLORADO AND EASTERN NEBRASKA, Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05G. W72-05819.

ANIMAL WASTE MANAGEMENT QUESTIONS AND ANSWERS,
Federal Water Pollution Control Administration,
Kansas City, Mo. Missouri Basin Region.
For primary bibliographic entry see Field 05G.

INVENTORY AND ASSESSMENT OF THE PROBLEM OF POLLUTION FROM FEEDLOT WASTES

North Dakota State Dept. of Health, Bismarck. Div. of Water Supply and Pollution Control. For primary bibliographic entry see Field 05G. W72-05832

ASSESSING THE PROBLEM OF FEEDLOT POLLUTION,
Missouri Univ., Columbia. Dept. of Agricultural

Missouri Univ., Columbia. Dept. of Agricultural Economics. For primary bibliographic entry see Field 05G. W72-05833

AGRICULTURAL RUNOFF - A BIBLIOG-RAPHY.

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-207 514, \$6.75 in paper copy. \$0.95 in microfiche. Water Resources Scientific Information Center WRSIC 72-204, January 1972. 248 n.

Descriptors: \*Farm wastes, \*Water pollution sources, \*Bibliographies, \*Abstracts, Information retrieval, Digital computers, Publications, Organic matter, Runoff, Overland flow, Fertilizers, Drainage, Agricultural watersheds, Ammonium salts, Nitrates, Nitrogen cycle, Environmental effects.

Identifiers: Permuted indexing, \*Agricultural runoff.

This bibliography contains 158 abstracts with full bibliographic details for selected reports, journal articles, and various documents published mostly since 1967. Produced from a computerized information base containing 35,675 abstracts at the time of search, the bibliography is representative of the information on agricultural runoff contained in the journal 'Selected Water Resources Abstracts' through December 15, 1971 (Volume 4, Number 24). A significant descriptor index is given of representative weighted terms that best describe the information content of the abstracted items. A comprehensive index is also given that represents all descriptors and identifiers used to index the various papers and documents represented by the abstracts in the bibliography. Abstract items are arranged in ascending WRSIC Accession Number sequence. (Lang-USGS)

GEOCHEMISTRY OF ORGANIC MATTER IN GROUNDWATER (K GEOKHIMII OR-GANICHESKIKH VESHCHESTV PODZEM-NYKH VOR

GANIC HESTAMAN
NYKH VOD),
All-Union Scientific Research Inst. of
Hydrogeology and Engineering Geology, Moscow
(USSR).
For primary bibliographic entry see Field 02K.

For primary bibliographic entry see Fig W72-05865

STEPHENSON COUNTY SURFACE WATER RESOURCES, Illinois Dept. of Conservation, Springfield. Div. of

Fisheries. For primary bibliographic entry see Field 02H. W72-05867

MOULTRIE COUNTY SURFACE WATER RESOURCES, Illinois Dept. of Conservation, Springfield. Div. of For primary bibliographic entry see Field 02H. W72-05868

GREENE COUNTY SURFACE WATER RESOURCES, Illinois Dept. of Conservation, Springfield. Div. of Fisheries. For primary bibliographic entry see Field 02H.

### 5C. Effects of Pollution

W72-05869

DIELDRIN IN WATER - A BIBLIOGRAPHY.
Office of Water Resources Research, Washington,
D.C. Water Resources Scientific Information
Center.
For primary bibliographic entry see Field 05B.
W72-05325

THERMAL RESISTANCE OF RAINBOW TROUT SALMO GAIRDNERI RICHARDSON TO ABRUPT TEMPERATURE VARIATIONS, Station d'Hydrobiologie Continentale, Biarritz (France).

(France).
Nicole Charlon, B. Barbier, and L. Bonnet.
Ann Hydrobiol. 1 (1): 73-89. 1970. Illus.
Identifiers: Abrupt, Pollution, Rainbow, Resistance, Salmo-Gairdneri, Temperature, Thermal, Trout, Variations.

The survival possibilities of S. gairdneri with sudden raises in temperature were studied. Tests of thermal resistance were directly derived from methods widely used in toxicology. It was possible to demonstrate that in the case of an artificial temperature raise of 7 deg. C due to thermal pollution of a thermal plant, a temperature of 14 deg. C should be retained as the critical threshold value upstream. The prime importance of the acclimation period on the thermal resistance of the species and the upper limit of acclimation at 27 deg. C, above which no possibility of survival exists, were shown.—Copyright 1971, Biological Abstracts, Inc. W72-05394

RADIUM IN AQUATIC FOOD CHAINS: RADI-UM UPTAKE BY FRESH WATER ALGAE,

Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.

Radiat Res. 46 (3): 490-505. 1971. Illus. Identifiers: Algae, Anacystis-Nidulans, Ankistrodesmus-Falcatus-Acicularis, Aquatic, Chains, Chlamydomonas-Simplex, Chlorella-Vulgaris, Coelastrum-Cambricum, Food, Fresh, Microcystis-Pulverea, Radium, Uptake.

Accumulation of 226Ra was studied in 4 species of green algae; Ankistrodesmus falcatus var. acicularis, Chlorella vulgaris, Coelastrum cambricum, Chlamydomonas simplex and 2 species of blue-Chiamydomonas simplex and 2 species of office green algae, Microcystis pulverea and Anacystis nidulans. Algae were cultivated in inorganic culture. Ra was added in amounts of 1 micro Ci/l., 0.1 micro Ci/l. and 0.01 micro Ci/l. After 14 days the amount of Ra in the medium in dead and living algal cells, and in washes from the algae was determined at intervals using a liquid scintillation counter. There were 2 characteristic types of response to Ra. The first was shown by A. falcatus acicularis and C. cambricum. From 50 to 80% of the Ra was absorbed within the cells and the amount absorbed was proportional to the length of exposure. In the 2nd type of response, typical of the other 4 spp. of algae, Ra was mostly absorbed on the cell surface (25-50%) and only 1-8% was present within the cells. The highest accumulative factor was reached after 24 hr of exposure. The accumulative factor of the Ra absorbed by the algae was inversely proportional to concentration of Ra in the medium. Ra uptake was dependent on the species of algae, the concentration of Ra in the medium, the growth rate of the algae and their physiological condition and the period of exposure. The factors responsible for radium accumulation were adsorption, absorption and incorpor tion, in that order of importance.--Copyright 1971, Biological Abstracts, Inc. W72-05406

THE EFFECT OF THE INSECTICIDE 'PINETOX' ON THE E. COLI AS A POLLUTION INDICATOR AND THE DETERMINATION OF THE BIODEGRADATION OF THE INSECTICIDE BY BIOLOGICAL TESTS, Instituted de Jaien Jeni (Proposition) of the control of the contro

Institutul de Igiena, Iasi (Rumania). Bakteriol. Lab. Kommunalhyg.

M. Finichiu, A. Dragomirescu, S. Freund, and I. Ichim.

Z Gestamte Hyg Grenzgeb. 15 (10): 763-767. 1969.

Illus. (English summary).
Identifiers: Biological, Daphnia, Degradation,
Determination, Escherichia-Coli, Flora, Indicator, Insecticide, Oxygen, Pinetox, Pollution, Stimula

tion, Tests.

The effect of the insecticide Pinetox (effective substance polychloropinene) upon the water microflora, and the fate of these micro-pollutants in the water were studied. The experiments were done with surface water. The total number of germs and the Escherichia coli in close correlation with the insecticide persistency, the toxicity test with daphnia was applied. This test proved to be very sensitive. The insecticide Pinetox exerts a strongly stimulating effect upon the microbic flora. This effect is due to the polychloropinene. The cellular respiration observed with the total flora supports the findings that endogenous O2 consumption increases along with the number of germs and the insecticide concentration. Pinetox is decomposed in the water due to biological and physical-chemical factors. The biodecomposing effect of the microbic flora is prevailing during the 1st 5 days. The physical-chemical factors take its place after. The investigation of E. coli has not revealed any changes in morphological and biochemical respect.--Copyright 1971, Biological Abstracts, Inc. W72-05412

ENVIRONMENTAL POLLUTION BY LEAD

AND OTHER METALS.
Illinois Univ., Urbana. Graduate Coll. For primary bibliographic entry see Field 05B.

AQUATIC AND MARINE MICROORGANISMS, INTERRELATIONSHIPS IN ENRICHMENT CULTURES.

Washington Univ., Seattle. Dept. of Microbiology. E. J. Ordal.

Available from the National Technical Informa-Available from the National Technical Information Service as AD-731 409, \$3.00 in paper copy, \$0.95 in microfiche. Final Technical Report 71-1, October 14, 1971. 18 p, 2 tab, 10 ref. Proj. No. NR306-487, N00014-67-A-0103-0006.

Descriptors: \*Bacteria, \*Cultures, \*Sea water, \*Nitrification, Ammonia, Nitrite, Sphaerotilus, Nitrification, Ammonia, Nitrite, Sphaerotilus, Nutrients, Pacific Ocean, Nitrate, Chemical analysis, Sodium chloride, Columbia River, Organic compounds, Vitamins, Yeasts, Sulfur, Fouling, Algae, Sulfates, Percolation, Herring, Salmon, Trout, Toxicity, Washington, Marine algae, Marine bacteria.

Identifiers: Hyphomicrobium, Vibrio anguillarum, Enrichment cultures, Agars, Chemostats, Nitrosomonas, Nitrobacter, Nitrosocystis oceanus, Sphaerotilus natans, Glucose, Galactose, Sucrose, Maltose, Mannital, Sorbital, Succinate, Fumarate, Butyrate, Butanol, Glycerol, Lactate, Pyruvate, Acetate, Ethanol, Benzoate, Propianate, Propanol, Laurato, Palmitate, n-heptylate, Xylose, Citrate, Yeast extract, Mineral salts, Caulobacter, Oligocarbophilic bacteria, Ulva, Desulfovibrio, Macromonas, Thiospir parahaemolyticus, Nitrifying bacteria.

The method of steady-state enrichment cultures was applied to the study of marine nitrifying bac-

teria. When low concentrations of ammonia or nitrite were employed, the nitrifying bacteria were found attached to the walls of the culture vessels. When concentrations of ammonia or nitrite were increased, the nitrifying bacteria appeared also in the culture fields enabling the isolation of pure cul-tures in liquid media. Agar was toxic and the nitrifying bacteria were found to require an unknown component in sea water in addition to sodium chloride. Control flow-through cultures of ocean water alone supported large populations of the budding, branching bacterium Hyphomicrobium, which also appeared in cultures with low concentrations of ammonia or nitrite. Hyphomicrobium fed by small concentrations of organic matter in sea water quickly appeared on glass, cellophane and metal surfaces and may be important as an initial step in fouling of vessels. Steady-state enrichment cultures were employed to determine the range of organic compounds used by Sphaerotilus. Cultures grown on glucose plus mineral salts grew well in enrichment cultures but failed to grow in pure culture unless vitamins were added. It was concluded that associated bacteria were providing the necessary vitamins for growth of Sphaerotilus.

A group of marine vibrios isolated from diseased salmon and herring were investigated by several methods. Strains of Vibrio anguillarum from the Pacific Northwest were closely related to strains from Scotland and Denmark. However, a number of other vibrios were clearly distinct, indicating that there are several kinds of marine vibrios. (Mortland-Battelle) W72-05421

CORRELATIONS BETWEEN RESPIRATION AND DIRECT UPTAKE OF DDT IN THE MOSQUITO FISH GAMBUSIA AFFINIS, Stanford Univ., Pacific Grove, Calif. Hopkins

Marine Station. P. G. Murphy, and J. V. Murphy.

Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 6, p 581-588, November/December 1971. 3 fig, 1 tab, 16 ref.

Descriptors: \*DDT, \*Pesticide residues, \*Respira-Descriptors. DD1, restude testades, Respution, "Absorption, Freshwater fish, Sunfishes, Rainbow trout, Radioactivity, Killifishes, Metabolites, Water temperature, Bioassay. Identifiers: "Mosquito fish, p p'-DDT, Gambusia affinis, Fundulus parripinnis, Lebistes reticulatus, Cyprinis carpio, Salnelinus fontinalis, Biological samples, Biological magnification, Liquid scintil-

The relationship between respiration rate and DDT uptake rate in the mosquito fish, Gambusia affinis, via the gills has been investigated. Experiments were performed at 5 degrees C and 20 degrees C to: (1) ascertain the relationship of DDT uptake to body weight and (2) measure the effect of temperature on DDT uptake from water with a constant carbon-14 labeled DDT concentration. The respiratory rates were measured at the experimental temperatures also. After the fish were exposed to carbon-14 labeled DDT, they were weighed, digested in acid, and extracted into hexane. Radioactivity was measured in concentrated extracts by liquid scintillation counting using the channels ratio method of quench correction. the DDT concentrations (40 ppt) used, diffusion rates of DDT and oxygen through the gills were similarly affected by changes in respiration volume, the smaller volume occurring at 5 degrees When graphed, a nearly linear relation was c. when graphed, a hearly linear relation was found to exist between the nanograms of carbon-14 labeled DDT taken up and the milliliters of ox-ygen consumed when the water concentration of DDT was about 40 ppt. (Holoman-Battelle) W72-05423

SOME RELATIONS BETWEEN ZOOPLANK-TON AND BUNKER C OIL IN CHEDABUCTO BAY FOLLOWING THE WRECK OF THE TANKER ARROW,

Bedford Inst., Dartmouth (Nova Scotia).

Journal of the Fisheries Research Board of Canada, Vol. 28, No. 9, p 1327-1330, September 1971. 2 fig, 6 ref.

Descriptors: \*Zooplankton, \*Copepods, \*Oil, Fluorescence, Spectrophotometry, Oily water, Feces, Path of pollutants, Toxicity, Sediments. Identifiers: Chedabucto Bay, Nova Scotia, Temora longicornis, Calamus finmarchicus, Metridia longa.

For more than three weeks following the wreck of the tanker Arrow in Chedabucto Bay (Nova Scotia) the feces of zooplankton collected at three samplings sites were analyzed chemically to determine: (1) if small oil particles in the size range of the natural food of zooplankton were ingested; and (2) what effect they might have on the animals and conversely, what effect passage through the gut of the zooplankton might have on these oil par-ticles. The amount of bunker C oil in the fecal samples was determined by either fluorescence or spectrophotometry. Analyses showed that as much as 10 percent of the bunker C in the water column was associated with zooplankton, and their feces contained up to 7 percent bunker C. The oil had no apparent effect on the organisms. In addition to the particulate oil which was exported from the bay by hydrodynamic processes, perhaps 20 percent more was sedimented to the bottom as zooplankton feces. (Holoman-Battelle) W72-05424

TOXICITY-METABOLISM RELATIONSHIP OF THE PHOTOISOMERS OF CYCLODIENE IN-SECTICIDES IN FRESHWATER ANIMALS, Illinois Univ., Chicago. Dept. of Biological

Sciences. E. Georgacakis, S. R. Chandran, and M. A. Q.

Khan.

Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 6, p 535-538, November/December 1971. 2 tab, 12 ref.

Descriptors: \*Metabolism, \*Aquatic animals, \*Chlorinated hydrocarbon pesticides, \*Pesticide toxicity, Aldrin, Dieldrin, Heptachlor, Path of pollutants, Crustaceans, Pesticide residues, Pesticides, Fish, Sunfishes, Bass, Crayfish, Gas chrocides, rish, Junisnes, Bass, Craytish, das cirro-matography, Larvae, Isopods, Minnows, Insects, Mosquitoes, Bioassay. Identifiers: "Photoisomers, "Cyclodiene insecti-cides, Aedes aegypti, Isodrin, Tadpoles,

Microcrustacea, Daphnia pulex, Asellus Spp., Gammarus spp., Gambarus spp., Gambia affinis, Guppies, Goldfish, Photoaldrin, Photodieldrin, Photoisodrin, Metabolites.

The toxicity-metabolism relationship of the photoisomers of the cyclodiene insecticides-aldrin, dieldrin, isodrin- in freshwater crustacea, fish, and tadpoles was investigated in order to determine (1) if the increased toxicity of these photoisomers to freshwater animals was due to the faster onset of toxic symptoms and (2) whether this could then be related to their metabolism as in insects. Each of the experiments was done in replicate and repeated at least twice after the animals were acclimated to distilled water. The production of photodieldrin ketone from photodieldrin was studied by injecting the test animals with 120 nanograms of photodieldrin in methylcellusolve, extracting the products in hexane and analyzing the products by gas chromatography. The onset of toxic symptoms of photoaldrin and photodieldrin is 3-5 times faster than aldrin and dieldrin in crayfish, bluegills, and minnows and 1.3-2.2 times in other animals. Photoisodrin is 3-5 times slower than isodrin in its toxic action against other animals tested. The increased toxicity of photoaldrin and photodieldrin is apparently related to the rate of in vivo formation of more toxic ketones as observed with photodieldrin. (Holoman-Battelle) W72-05425

### Group 5C—Effects of Pollution

MACROZOOPLANKTON AND SMALL NEKTON IN THE COASTAL WATERS OFF VANCOUVER ISLAND (CANADA) AND WASHING-TON, SPRING AND FALL OF 1963, National Marine Fisheries Service, Washington,

D. S. Day.

Special Scientific Report - Fisheries No. 619,
January 1971. 94 p, 19 fig, 13 tab, 19 ref.

Descriptors: \*Zooplankton, \*Necton, \*Trawling, Posteriputs. Pacific Ocean, Biomass, Seasonal, Sampling, Fish, Filters, Washington, Crabs, Amphipoda, Copepods, Annelids. Identifiers: Mysids, Euphausiids, Isaacs-Kidd trawl, Macrozooplankton, British Columbia,

trawi, Macrozoopiankton, Brusan Columbia, Euphausia pacifica, Thysanoessa spinifera, Ne-matoscelis difficilis, Thysanoessa longipes, Ne-matobrachion flexipes, Tessarabrachion oculatus, Thysanoessa raschii, Tractostoma macropus, Electrona arctria, Diaphus theta, Lampanyctus leucopsarus, Lampanyctus ritteri, Lestidium ringens, Cololabis saira, Protomyctophum crockeri, Symbolophorus coliforniensis, Stenobrachins leucopsarus, Neomysis kadiakensis, Neomysis rayii, Neomysis americana, Acanthomysis macropsis, Acanthomysis columbiae, Stylocheiron maximum, Bethylagidae, Melanostomiatidae, Myctophidae, Engraulidae, Osmeridae, Scom-Anoplomatidae, Ammodytidae, fish, Tarletonbeannia crenularis, Paraleptidae, beresocidae, Mesopelagic fish, Tarletonbeannia Euphausiacea, Chaetognatha, Pteropoda, Sergestidae, Caridea, Cnidarica. Cumacea,

Macrozooplankton and small nekton were collected from the upper 150 m of the water column during cruises off the Pacific Northwest Coast. Cruises were run along four lines perpendicular to the shore from May 3 to May 16 and October 28 to November 22, 1963 using a 0.9 m Isaacs-Kidd midwater trawl. The report summarizes data on the abundance, distribution, and composition of organisms over the continental shelf. Eight species of euphausiids, 5 species of mysids, and 14 species of fish were identified. Euphausiids composed about 90 percent of the biomass; 76 percent of these were Euphausia pacifica. The biomass was generally lowest near shore, highest near the outer edge of the continental shelf, and lower again further offshore. It was significantly higher in the southern part of the region studied with an apparent relationship to surface circulation. The biomass decreased from spring to fall. At night, the majority of specimens were taken in the upper 30 m. Numerous mesopelogic fish were taken over the continental slope, few at the edge of the shelf, and none over the shelf. These were caught primarily at the surface. Crab larvae and postlarval benthic fish were taken primarily from the surface of the benthos at 75 m, but few euphausiids were found at these depths. (Mortland-Battelle)

#### SELECTIVE SORPTION OF BACTERIA FROM SEAWATER.

Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics. K. C. Marshall, R. Stout, and R. Mitchell.

Canadian Journal of Microbiology, Vol. 17, No. 11, p 1413-1416, November 1971, 12 fig, 11 ref.

Descriptors: \*Sea water, \*Adsorption, \*Marine bacteria, \*Surfaces, \*Coliforms, Growth rate, Microorganisms, Massachusetts, Electron microscopy, Sampling.
Identifiers: Vibrio, Caulobacter, Hyphomicrobia,

Coccobacilli.

To determine whether certain primary colonizers modify surfaces in sea water to make them more amenable to colonization by other organisms, glass plates and electron microscope grids were immersed in the sea and in sea water samples obtained from Winthrop, Nahant, and Woods Hole, Massachusetts for periods up to 24 hours. After various periods of time slides were removed and examined microscopically for sorbed bacteria. A sequence of sorption of different bacterial types has been observed both on glass slides and electron microscope grids immersed in seawater for periods of up to 24 hours. A comparison of morphological groups of bacteria initially attracted to a surface with those subsequently adhering firmly to the surface suggests a selective irreversi-ble sorption of small rods. Firm adhesion of bacteria in the time periods considered does not in-dicate pili or holdfast structures. The ability of bacteria to produce extracellular polymeric fibrils may be important in such selective sorption. (Jef-feris-Battelle)

### PLANKTON POPULATION STRUCTURE IN THE LOWER COEUR D'ALENE RIVER, DELTA, AND LAKE,

Idaho Univ., Moscow Robert F. Minter, Jr.

MS Thesis, September 1971. 72 p, 15 fig, 20 tab, 33 ref, append. OWRR A-030-IDA (1).

Descriptors: \*Plankton, \*Biological communities, \*Succession, \*Idaho, \*Rivers, Lakes, Deltas, Productivity, Physicochemical properties, Zooplankton, Seasonal, Winds, Turbidity, Conductivity, Dissolved oxygen, Alkalinity, Hydrogen ion concentration, Heavy metals, Toxicity, Tem-Nannoplankton, Phytoplankton, Copepods, Rotifers, Crustaceans, crop, Cyanophyta, Chlorophyta, Diatoms, Standing Chrysophyta, Pyrrophyta. Identifiers: \*Coeur d'Alene River (Idaho), St Joe River (Idaho).

As basis for evaluating changes in future water uses or treatment, plankton populations and seasonal variation in plankton community structure in Idaho's Coeur d'Alene River, delta, and open lake, and the lower St Joe River were mea-sured in physicochemical parameters and these related to changes in the plankton community. Plankton organisms in the river followed similar seasonal cycles in composition to those in delta and open lake waters, but in considerably lower numbers. Plankton populations were higher and more diversified in the St Joe River, which was above mining operations, than in the Coeur d'Alene River during the 1970 summer. Data collected at each station were: transparency measureneeds at each station were: transparency measurements, air and water temperatures, dissolved oxygen, hydrogen ion concentration, alkalinity, electrical conductivity, net phytoplankton, nan poplankton, and zooplankton. Wind action, river discharge, turbidity, conductivity, and allochthonous material apparently influence plankton communities in both the Court d'Alene River. ton communities in both the Coeur d'Alene River and delta. Dissolved oxygen, alkalinity, and pH were not limiting factors on the biological community. Settling ponds improved river water quality with respect to suspended solids but have not eliminated high concentrations of heavy metals toxic to the biological community. (Jones-Wiscon-W72-05452

#### ECOLOGY OF CLADOPHORA FRACTA AND CLADOPHORA GLOMERATA,

Syracuse Univ., N.Y. Daniel F. Jackson, and Shunn-Dar Lin. Federal Water Pollution Control Administration, No 16010--05/68, Final Report, May 1968. 133 p, 10 fig, 19 tab, 93 ref, append. FWPCA-WP 00782.

\*Eutrophication, \*Algae, Photosynthesis, \*Respiration, Great Lakes, Nuisance algae, Water quality, Nutrients, Phosphorus, Nitrogen, Calcium chloride, Temperature, Metabolism, Epiphytology, On-site tests, Laboratory tests, Lotic environments, Len tic environments.

Identifiers: \*Cladophora fracta, Cladophora glomerata, Butternut Creek (NY).

Determinations of respiration and photosynthetic rates of Cladophora fracta and Cladophora

glomerata under natural and laboratory conditions, and nitrate and phosphate requirements under laboratory conditions were made. In the laboratory, Cladophora fracta respiration and photosynthetic rates were greater when oscillated at 120 strokes per minute than with no oscillation. The highest Cladophora fracta metabolic rates were observed in the medium lacking calcium chloride. Markedly low rates were obtained in media lacking nitrate and phosphate. With small increases (0.00 to 0.01 mg/l) of either nitrate or phosphate concentration, Cladophora glomerate photosynthetic rate increased significantly. With no phosphate, Cladophora glomerate respiration rate was erratic. Photosynthetic rate was not affected by nitrate concentration varying from 0.01 to 100.00 mg/l. It is concluded that phosphorus is a limiting factor of Cladophora growth. Cladophora metabolic rates were not influenced by phosphate concentration levels 0.01 to 5.00g/l in nitrate-free media. Generally, Cladophora glomerate respira-tion and photosynthetic rates increased as the combination of nitrate and phosphate doses increased. Cladophora glomerate respiration and photosynthetic rates under natural conditions were about three and six times, respectively, greater than under laboratory conditions. (Jones Wisconsin) W72-05453

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#### CATALYTIC MOBILIZATION OF PHOSPHATE IN LAKE WATER AND BY CYANOPHYTA, Giessen Univ. (West Germany). Lehrstuhl Botank

(II) Wolfgang Reichardt.

Hydrobiologia, Vol 38, No 3-4, p 377-391, 1971. 6 fig, 2 tab, 27 ref.

\*Eutrophication, \*Phosphates, Descriptors: Descriptors: \*Eutrophication, \*Phosphates, \*Cyanophyta, \*Catalysts, Hydrolysis, Enzymes, Phosphorus, Laboratory tests, Kinetics, Lakes, Temperature, Hydrogen ion concentration, Chemical analysis, Cultures, Bacteria, Proteins. Identifiers: Lake Pluss (Germany), Lake Heiden (Germany), Phosphatases, Ortho-phosphate, Phosphorus mobilization, Phosphomonoesterases, Hydrolitic dephosphorylation Hydrolitic dephosphorylation.

To understand the phosphorus budget in lake water the concentration of different phosphorus compounds must be known together with their turnover rate. Catalytic hydrolysis of these com-pounds by phosphatases is probably an important mechanism for ortho-phosphate regeneration. This study attempts to relate phosphatase activity to environmental variations. Catalytic conditions of phosphorus hydrolysis compound were examined in some eutrophic lakes and in blue-green algal axenic cultures. In three lake biotopes, circadian fluctuations of phosphomonoesterases cor-responded with the content of dissolved phosphorus compounds and saprophytic bacterial counts. In vertical profiles of Lake Pluss (Germany) phosphomonoestarase activities were subjected to annual fluctuations. Kinetic parameters rather than mere activities appeared correlated with environmental concentrations of phosphate; these results corresponded largely with some physiological regulations of phosphomonoesterase activities observed in blue-green algal cultures in relation to some defined environmental factors. Anacystis nidulans (axenic strain) utilized different hydrolyzable phosphorus compounds to a certain degree. In both culture filtrates and disintegrated cells, activities and kinetic parameters were tested. Efficiency of dephosphorylation esti-mated by this means increased when cells were grown in culture media limited by the phosphorus source or when growth was retarded by other environmental factors. (Jones-Wisconsin) W72-05456

## BACTERICAL PATHOGENS OF FRESHWATER

BLUE-GREEN ALGAE, Dundee Univ. (Scotland). Dept. of Biological

M. J. Daft, and W. D. P. Stewart.

New Phytologist, Vol 70, No 5, p 819-829, 1971. 6 fig, 3 tab, 2 plates, 12 ref.

Descriptors: \*Biocontrol, \*Pathogenic bacteria, \*Algal control, Fresh water, Cyanophyta, Myx-obacteria, Cultures, Metabolism, Sewage, Carbohydrates, Hydrogen ion concentration, perature, Enzymes, Cellulose, Viruses, Human pathology, Systematics. Identifiers: Lytic bacteria, England, Metabolic in-

hibition, Hosts, Myxophyceae, Scotland.

Evidence is presented that heterotrophic bacteria which are pathogenic to certain blue-green algae occur in British freshwater habitats. Four bacterial isolates were obtained which cause lysis in laboratory cultures and natural populations of blue-green algae. The organisms are tentatively identified as members of the Myxobacterales. The host range of these strains is wide and species belonging to all orders of Myxophyceae are susceptible. The isolates also lyse a variety of gram-negative and gram positive bacteria and are capable of growth free from hosts, and their inhibitory effect is rapid (in some instances within 2-5 hours). Some bacteria susceptible are human pathogens thus it may be that three of the lytic bacteria obtained from sewage ponds decrease bacterial numbers which are pathogenic to man. The findings, if extrapolated to natural populations, suggest that given sufficient lytic bacteria, algal blooms will not occur, unless resistant strains are present. Possibly algal formation could be regulated to some degree by the extent to which algal growth outstrips, or is outstripped by, the growth of algal pathogens. The isolates can be propagated readily in the absence of hosts. (Auen-Wisconsin) W72-05457

DARK HETEROTROPHIC GROWTH OF AN ENDOPHYTIC BLUE-GREEN ALGA,
Texas Univ., Port Aransas. Inst. of Marine

Derek S. Hoare, Lonnie O. Ingram, E. Larry Thurston, and Robert Walkup. Archiv fur Microbiologie, Vol 78, p 310-321, 1971. 9 fig, 1 tab, 29 ref. NSF GB8173.

Descriptors: \*Cyanophyta, \*Pigments, \*Plant growth, Cultures, Carbohydrates, Aerobic conditions, Anaerobic conditions, Colorimetry, Light intensity, Carbon dioxide, Nitrogen, Metabolism, Respiration, Photosynthesis, Bacteria, Symbiosis. Identifiers: \*Dark heterotrophic growth, \*En dophytes, Nostoc, Dark cultures, Photoau-totrophic growth, Casamino acids, Tolypothrix tenuis, Chlorogloea fritschii, Culindrotheca fusiformis, Rhodospirillum rubrum.

Blue-green algae occur in the coralloid roots of a number of cycads. Pure cultures of endophytic blue-green algae from cycads became available as a result of a simple micromanipulation technique. One of these isolates, Nostoc, was examined to determine its heterotrophic potentialities. An ax-enic culture from roots of Macrozamia lucida grows heterotrophically in complete darkness at measurable and reproducible rates, thus differing from most blue-green algae. Heterotrophic growth was supported by glucose, fructose, and sucrose over the pH range 6 to 9. The growth rate with glu-cose was increased if casamino acids were added; heterotrophic growth on glucose proceeded under both aerobic and anaerobic conditions. Cultures grown in the dark were pigmented. There was no significant difference in the ultrastructure of photoautotrophically grown and dark heterotrophically grown cells. When growing within the coralloid roots of cycads it is presumably growing heterotrophically at the expense of carbohydrates within the cycad. This unique symbiotic system merits further analysis using biochemical techniques. The possibility of dark heterotrophic growth of blue-green algae in other natural environments such as muds or deep layers of eutrophic lakes is raised. (Jones-Wiscon W72-05458

SEASONAL VARIATION IN PRIMARY PRODUCTIVITY IN THREE TROPICAL PONDS, Madurai Univ. (India). Dept. of Biological

Sciences

Sumitra Vijayaraghavan. Hydrobiologia, Vol 38, No 3-4, p 395-408, 1971. 4 fig, 4 tab, 24 ref.

Descriptors: \*Primary productivity, \*Seasonal, \*Tropical regions, \*Ponds, Temperature, Hydrogen ion concentration, Turbidity, Alkalinity, Chlorophyll, Organic matter, Light intensity, Respiration, Weather, Phytoplankton, Nutrients. Identifiers: South India.

Primary productivity studies in aquatic environments are not only useful for comparing produc-tivity of different geographical regions, but are also of practical value in fish culture programs. Knowledge on primary production in the tropics is meager thus the seasonal trend of primary productton in tropical biotopes, in view of the absence of distinct climatic changes throughout the year, were investigated in three ponds; two were permanent (Othakadai pond and Teppakulam tank) and the other astatic (Yanamalai pond). Pri-mary productivity experiments were conducted by the dark-and-light bottle technique. Water temperature, pH, transparency were recorded; al-kalinity, chlorophyll a, and organic matter were estimated. Primary production in each pond describes its own pattern; most of the environmen-tal parameters recorded show a certain degree of relationship. In all three ponds, temperature and chlorophyll a showed a more or less direct correlation to productivity values. Alkalinity and productivity values showed a positive correlation in Othakadai and Yanamalai ponds, while no relationship between alkalinity and productivity could be established in Teppakulam tank. (Jones-Wisconsin) W72-05460

OUTFALL SIMULATION EXPERIMENT IN LAKE ONTARIO.

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Waterloo Univ. (Ontario).

C. R. Murthy, and G. T. Csanady. Water Research, Vol 5, p 813-822, 1971. 8 fig, 3

Descriptors: \*Analytical techniques, \*Water pollution effects, \*Lake Ontario, \*Effluents, Simulation analysis, Path of pollutants, Great Lakes, Tracers, Depth, Density, Thermocline, Currents (Water), Dispersion, Dye releases, Profiles, Tracking techniques, Hypolimnion, Velocity, Tracking techniques, Hypolimnion, Velocity, Methodology.
Identifiers: Plume, Vertical profiles, Horizontal profiles.

Many sewage outfalls release their load at lake bottom some distance off shore. For evidence on diffusion in the hypolimnion an 'Outfall Simula-tion Experiment' was conducted. The question arises how effluents, discharged at depth diffuse, when their density equals lake water density, especially when a thermocline is interposed between the outfall and free surface. Evidence on current structure in the shore zone indicates that bottom currents under such conditions are very slow. Rhodamine B dye was released in Lake Ontario, in water 20 m deep, 3 m from the bottom, from a 10 m long diffuse pipe arranged horizontally. The difficulties of maintaining steady dye flow so far below the surface were so great that only a few surveys were made in 1970. The observed dye concentration profiles showed that vertical sections centration profiles showed that vertical security across the dye plume were regular (somewhat similar to Gaussian profiles); horizontal distributions were, by contrast, many-peaked, mostly very much wider than comparable dye plumes near the surface, and, sometimes consisted only of discrete dye patches, hundreds of meters distant. These diffusion features may be attributed to the wave-like character of flow at low residual velocity. (Jones-Wisconsin) A FEASIBILITY STUDY USING CONSERVA TION WEBBING AS AN ARTIFICIAL SUB TION WEBBING AS AN ARTIFICIAL SUB-STRATE IN MACROBENTHIC STUDIES, Virginia Commonwealth Univ., Richmond. Dept.

of Biology. George M. Simmons, Jr., and Avis Winfield. Virginia Academy of Science, Vol 22, No 2, p 52-59, 1971. 8 fig, 1 tab, 22 ref. OWRR A-013-VA (2).

Descriptors: "Analytical techniques, "Benthic fauna, "Feasibility studies, "On-site investigations, Streams, Biological communities, Aquatic insects, Diptera, Stoneflies, Life history studies, Sampling, Virginia, Temperature, Turbidny, Density, Invertebrates, Oligochaetes, Crustaceans. Identifiers: "Artificial substrate, "Conservation Webbin 1988. Webbing, Plecoptera, Trichoptera, Ephemeroptera, Odonata, North Anna River (Va), Megaloptera,

The community structure of benthic macroinvertebrates is frequently used for evaluating strea that receive agricultural, domestic, or industrial effluents since bottom organisms are ideal indicators of stream conditions. Their restricted habitat preference, low mobility, sufficiently long life cycles make them quickly and directly affected by deteriorating environmental influences. An artificial substrate, Conservation Webbing, was used in a feasibility study to ascertain the degree to which the macrobenthic species collected on the substrate material mirrored the natural stream community. Four orders of aquatic insects were consistently found on the substrate. Two of the order, Plecoptera and Diptera, showed a statistically sig-nificant increase in numbers with increasing time. Conservation Webbing collected 63% of the fauna known to occur in the stream, therefore the data from the substrate cannot be interpreted as representative of the natural community. However, the substrate is ideally suited for life history studies of certain bottom fauna, since the sub strate collects certain species which were either not as abundant in ordinary routine sampling or missed completely. The Chironomidae are readily collected. (Jones-Wisconsin) W72-05464

AN ECOLOGICAL STUDY OF A POOL SUB-JECT TO VARYING SALINITY (SWANPOOL,

JECT 10 VARIANO SALANI FRALMOUTH), Bristol Univ. (England). Dept. of Zoology. R. S. K. Barnes, A. E. Dorey, and Colin Little. Journal of Animal Ecology, Vol 40, No 3, p 709-734, 1971. 3 fig, 13 tab, 43 ref.

Descriptors: \*Brackish water, \*Lagoons, \*Salini-Topography, Sea water, Rooted aquatic plants, Topography, Sea water, Rooted aquatic plants, Habitats, Benthos, Zooplankton, Invertebrates, Copepods, Marshes, Fresh water, Hydrography, Annelids, Mollusks, Crustaceans, Insects, Streams, Fish, Springs, Swamps, Oligochaetes,

Identifiers: \*Swanpool (England), Reeds, Coleoptera, Pools, Ectopracta, Mixo-oligohaline waters,

Swanpool, Falmouth, Cornwall, England, a mixooligonaline lagoon, with a functional two-way con-nection with the sea, experiences periodic influxes of seawater. The fauna and flora of its freshwater inflow systems with associated marshes, of the pool itself, and of its outlet system, together with the transitional zones between these regions, are described. The pool contains a comparative paucity of permanent fauna species with the occa influx of elements otherwise typical of the inflow stream and of the more saline outlet region; and a sporadic abundance of different species in different years, and species associated with fresh water habitats, and those tolerant of brackish conditions. The sparse, sporadic zooplankton is of freshwater affinity; the pool is fringed by ap-parently mutually exclusive beds of Scirpus maritimus and of Phragmites. Swanpool fauna is compared with those of similar habitats, and it is considered that such environments may exhibit a certain constancy of pattern, although the in-

### Group 5C-Effects of Pollution

dividual pattern may be composed of widely differing units in different examples. This pattern is particularly surprising in view of the possibility that these environments may be extremely unsta-ble faunistically. (Jones-Wisconsin) W72-05466

A PHYSICAL-CHEMICAL STUDY OF THE FLUSHING OF THE SANTA BARBARA BASIN, Scripps Institution of Oceanography, La Jolla Calif.

Edward R. Sholkovitz, and Joris M. Gieskes. Limnology and Oceanography, Vol 16, No 3, p 479-489, 1971. 7 fig, 1 tab, 31 ref.

\*Physicochemical properties. Descriptors: Translocation, \*California, \*Basins, \*Sea water, Mixing, Salinity, Oxygenation, Hydrography, Oceanography, Depth, Nutrients, Seasonal, Diffusion, Sediment-water interfaces, Mathematical models, Currents (Water).

Identifiers: \*Flushing, \*Santa Barbara Basin

Identifiers: \*Flushing, \*Santa (Calif), Marine basins, Upwelling.

The first direct evidence of flushing of any California basin suggests that its oceanography is dynamic and that it is capable of flushing on a shorter time scale than previously thought. Detailed vertical profiles of salinity, temperature, oxygen, nitrate, phosphate, nitrite, and silicate have been taken on six cruises over a 14-month period in the Santa Barbara basin. During a period of intense upwelling (May 1970), the temperature, oxygen, and nitrate content of the basin water from the sill (475 meters) to the bottom (580 meters) showed significant changes from normal conditions; the oxygen content increased; the nitrate concentration, which previously decreased mar-kedly below the sill due to nitrate reduction, showed little nitrate reduction; and the tempera-ture decreased by 0.14-0.19C. The results from two subsequent cruises in June and July 1970 kinetically follow the basin water back to its normal conditions. After two months the oxygen content had almost returned to normal, while the water temperature rose at a rate of 0.02-0.04C per month. The data indicate that the Santa Barbara basin was flushed out with seawater coming over the sill. (Iones-Wisconsin) W72-05467

LAKE KINNERET: THE NUTRIENT CHEMISTRY OF THE SEDIMENTS, Kinneret Limnological Lab., Tiberias (Israel).

C. Serruya.

Limnology and Oceanography, Vol 16, No 3, p 510-521, 1971. 8 fig, 7 tab, 15 ref.

Descriptors: \*Trophic level, \*Lakes, \*Nutrients, \*Chemical properties, \*Sediments, Clays, Cores, Seasonal, Algae, Mud-water interfaces, Iron, Manganese, Phosphorus, Nitrogen, Organic matter, Calcium carbonate, Detritus, Plankton, Adsorption, Eutrophication, Temperature, Light penetration, Ammonia, Phosphates, Saline water. Identifiers: \*Lake Kinneret (Israel), Bottom waters, River Jordan (Israel) waters, River Jordan (Israel).

To understand eutrophication processes in Lake Kinneret, Israel, important as a water supply, bottom deposits were studied. The bottom waters were sampled once a week for two years, mud samples were obtained with a dredge, and cores taken. Since the sediments may actively contribute to the nutrient supply causing winter algal bloom, the mud-water exchanges were investigated. Tem-perature was recorded with relation to the seasons, coldwater brought in by the River Jordan, discharge of the submarine hot springs, and internal waves. Light transmission was measured. The concentrations of iron, manganese, phosphorus, nitrogen, organic carbon, and calcium carbonate in recent sediments were determined for the whole lake and the results discussed in the light of the chemical conditions of bottom waters, the detrital input, and the plankton composition. Only 4% of the total autotrophic carbon is withdrawn from the

lake cycle by the sediments. The lake muds concentrate phosphorus in spite of the prevailing reducing conditions, which suggests an active physical adsorption. The specific clay surfaces could be used as nutrient fixers to slow eutrophication. (Jones-Wisconsin) W72-05469

AN ECOLOGICAL STUDY OF THE MACROPHYTIC VEGETATION OF THE DOODHADHARI LAKE, RAIPUR, M P, INDIA, Government Coll. of Science, Raipur (India). THE Dept. of Botany.

Hydrobiologia, Vol 38, No 3-4, p 479-487, 1971. 4 fig. 1 tab, 6 ref, append.

Descriptors: \*Ecology, \*Aquatic plants, Seasonal, Depth, Diurnal, Light penetration, Temperature, Lakes, Stratification, Light intensity, Submerged plants, Floating plants, Turbidity, Rooted aquatic

\*Doodhadhari (India). Identifiers: Lake Nelumbo nucifera, Macrophytes, Trapa, Najas minor, Pistia stratiotes, Eichhornia crassipes.

Seasonal changes in physicochemical complexes in Doodhadhari Lake, Raipur, India, were studied during 1967-68 at eight stations established at different depths; water and air temperatures were determined monthly, morning and evening, and light penetration and transparency measured. Thermal stratification was found to be induced by solar radiation during daytime and destroyed by nocturnal cooling and mixing of the lake waters. Light intensities at different strata were found to be reduced by plant growth. At 0.5 m depth and 1 m depth considerable light intensity reduction was found. The minimal light transmission to deeper strata coincides with dense plant growth. In April and in the late rainy season (September to November) the light intensity at the 1 m stratum was reduced to 0.5-0.6%; this percentage becomes further reduced to 0.0-0.1% at shallow water stations where thickly growing Nelumbo stands have closely spread floating leaves from rooted plants. No light could be detected even at half meter depth in thickly growing sudd communities consisting of Pistia stratiotes and Eichhornia crassipes in another part of the lake. (Jones-Wisconsin) W72-05470

NUTRIENT-LIMITED MODEL OF PHYTOPLANKTON GROWTH,

Washington Univ., Seattle. Dept. of Oceanography; and Alaska Univ., College. Inst. of Marine

Richard C. Dugdale, and John J. Goering. In: Impingement of Man on the Oceans, p 589-600. Donald W. Hood, ed. Wiley-Inter Science, New York, 1971. 22 ref.

Descriptors: \*Sewage disposal, \*Nutrients, \*Phytoplankton, \*Marine microorganisms, Model studies, Oceans, Nitrogen, Phosphorus, Productivity, Coasts, Absorption, Organic matter, Biodegradation, Water pollution control, Diatoms, Nitrates, Nitrites, Ammonia, Sewage, Primary production, Biochemical oxygen demand, Mixing, Eutrophication, Dinoflagellates. Identifiers: \*Marine sewage outfalls, Silicon,

Mineralization.

There exists the lack of a theoretical basis on which the nutrient-phytoplankton consequences could be incorporated into sewage outfall design. Successful control of phytoplankton growth in coastal systems fertilized with sewage nutrients requires a thorough understanding of the natural, physical, chemical, and biological features of these systems. Organic matter production by algae utilizing nutrients resulting from oxidation of organic matter in sewage is mathematically modeled; the nutrient-oriented compartmental model may be useful in treating problems of effluent disposal containing nutrients required in algal growth. The model is intended for application under conditions of steady state or transient-nutrient limitation. The gross chemical composition of sewage intended for use in controlling phytoplankton growth must be known before any success in regulating primary production will be realized. The advantages result-ing from processing sewage in the marine environ-ment euphotic zone in a manner analogous to freshwater oxidation ponds is discussed. An in-terim approach might be found in artificial ponds with seawater and sewage effluent mixed to obtain continuous algal growth. This accomplishment should lead to a more controlled processing of sewage discharged to the marine environment and utilizing the nutrients now wasted. (Jones-Wiscon-W72-05471

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MICROBIOLOGICAL STUDIES ON NITROGEN FIXATION IN AQUATIC ENVIRONMENTS-II. ON THE DISTRIBUTION OF NITROGEN FIX-ING BACTERIA IN SEA WATER REGIONS, Kyoto Univ. (Japan), Research Inst. for Food Science; and Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries. Akira Kawai, and Isao Sugahara.

Descriptors: \*Nitrogen fixation, \*Aquatic environment, \*Nitrogen fixing bacteria, \*Sea water, Distribution, Standing crop, Bays, Surface waters, Depth, Dissolved oxygen, Chemical oxygen demand, Ammonia, Nitrites, Nitrates, Phosphates, Chemical analysis, Temperature, Salinity. Identifiers: Maizura Bay (Japan), Kumihama Bay (Japan), East China Sea, Suruga Bay (Japan), Sagami Bay (Japan), Heterotrophic bacteria.

The process by which atmospheric nitrogen enters into the biosphere is one of the most important in the aquatic nitrogen cycle. Distribution of nitrogen fixing bacteria in Japanese offshore waters was studied. The standing crop of the bacteria in inland bays was 10 to 100 cells/ml, such as Maizuru Bay and Kumihama Bay in Kyoto Prefecture, while the number was quite small in offshore waters in Suruga Bay and Sagami Bay-0 to 800 cells/l. In the open water of the East China Sea, the standing crop of the nitrogen fixing bacteria was as small as 0 to 400 cells/l; these were detected mostly in the surface water above 100 meters, and the bacterial number decreased rapidly with depth below 100 meters. From the data of vertical salinity distribution, water temperature, and bacteria, there may be different kinds of water masses at depths of 0 to 100 meters and below 100 meters. Nitrogen fixing bacteria and total heterotrophic bacteria in each water mass were scant in offshore regions as compared with those of inland bays. (Jones-Wisconsin) W72-05472

ABCS OF CULTURAL EUTROPHICATION AND ITS CONTROL: PART 2--WASTEWATERS, Metcalf and Eddy, Inc., Boston, Mass.

Clair N. Sawyer. Water and Sewage Works, p 322-327, October 1971. 9 fig, 1 tab, 4 ref.

Descriptors: \*Eutrophication, \*Water pollution control, \*Waste water (Pollution), Virginia, Nutrients, Nitrogen, Phosphorus, Sewage ef-fluents, Sewage treatment, Algae, Water pollution sources, Chlorophyta, Cyanophyta, Washington, Diversion, Lake Erie, Nitrogen fixation, Deter-gents, Carbon dioxide, Alkalinity, Burning, Domestic wastes, Industrial wastes, Agriculture, Surface runoff, Wisconsin.
Identifiers: \*Nitrogen:phosphorus ratio, Lake

Waubesa (Wis), Occoquan Reservoir (Va), Madison (Wis), Lake Mendota (Wis), Lake Monona (Wis), Lake Kegonsa (Wis), Lake Washington (Wash), Green Lake (Wash).

Wastewaters as a nutrient source becomes apparent in the cultural eutrophication problem. Data prior to the advent of synthetic detergents containing phosphates were collected from Lake Waubesa, Wisconsin. Occoquan Reservoir, Virginia,

indicated a larger relative increase in phosphorus, as compared to nitrogen than that entering Lake Waubesa, probably due to the higher phosphorus waturess, processory due to the ingliet principlositories content of modern sewages due to phosphate-bearing synthetic detergents. Cultural eutrophication control depends upon limiting the input of both phosphorus and nitrogen. Of the major inorganic nutrient sources, domestic and industrial wastewaters are easiest to contain and treat while agricultural sources are probably the most difficult to control; phosphorus control alone may suffice in some locations. Lakes Waubesa and Kegonsa (Wisconsin) and Lake Washington have recovered after diversion of sewage. The basic philosophy is scientifically correct that, if the degree of cultural eutrophication is related to the degree of fertilization, any reduction in wastewater quantity or in equivalent nutrients should reduce primary productivity. Elimination of phosphates in deter-gents would be beneficial to the Great Lakes; removal of 80% of phosphorus from wastewaters may or may not be adequate, depending upon lake size and detention time. (Jones-Wisconsin) W72-05473

OCCURRENCE AND DISTRIBUTION OF PHOSPHATE SOLUBILIZING BACTERIA AND PHOSPHATASE IN MARINE SEDIMENTS AT

Centre of Advanced Study in Marine Biology, Porto Novo (India).

K. Ayyakkannu, and D. Chandramohan. Marine Biology, Vol 11, p 201-205, 1971. 4 fig, 2

Descriptors: \*Phosphates, \*Bacteria, \*Marine bacteria, \*Productivity, \*Sediments, Oceans, Descriptors. "Productivity, "Sediments, Oceans, Clays, Sands, Salinity, Hydrogen ion concentra-tion, Estuaries, Fresh water, Organic matter. Identifiers: "Porto Novo (S India), "Phosphatase activity, Marine sediments.

The nature and activity of phosphatase and of phosphate solubilizing bacteria in marine sediments of the Porto Novo region (South India) were studied. A probability exists that the phosphatase activity may regulate the phosphate content of the sediments, which, in turn influence the phosphate level of the overlying water. The various factors of the sediments in maintaining phosphate availability in the overlying water is discussed. The occurrence and distribution of a special group of bac-teria were studied and recognized in the culture medium by the clear solubilization zones around their colonies on the third day of incubation, and their phosphatase activity was investigated. Clayey sediments contained more phosphate solubilizing bacteria and phosphatase than sandy sediments. There was a positive correlation between the total phosphate content and the phosphatase activity. The phosphatase activity was recorded in all samples collected from marine, estuarine, and freshwater sediments irrespective of salinity variations. A direct relationship is seen between the numbers of phosphate solubilizing bacteria and phosphatase activity in various sediments. (Jones-Wisconsin) W72-05474

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RELATIONSHIP BETWEEN PHOSPHATES AND ALKALINE PHOSPHATASE OF ANABAENA FLOS-AQUAE IN CONTINUOUS

CULTURE, Queen's Univ. Kingston (Ontario). Dept. of Chemical Engineering.

Derek H. Bone. Archiv fur Mikrobiologie, Vol 80, p 147-153, 1971. 3 tab. 16 ref.

Descriptors: "Algae, "Phosphates, "Enzymes, "Cultures, Nitrates, Plant physiology, Plant growth, Biomass, Growth rates, Light intensity, Carbon dioxide, Nitrogen, Laboratory tests, Cyanophyta, Cytological studies. Identifiers: "Alkaline phosphatase, "Anabaena flos-aquae, "Continuous culture, Chemostats, Phosphatase activity.

To define interrelationships between growth and important physiological characteristics, the continuous cultivation technique was applied. Anabaena flos-aquae was grown in chemostats with phosphate-limiting growth and various dilu-tion rates to ascertain the influence of dilution rates, phosphate and nitrate concentrations on the yields and alkaline phosphatase activity of the alga. Steady state conditions were assumed to exist when the dry weight enzyme activities and chemical analysis were constant for four consecu-tive days. The cell yields were dependent on dilution rate and a two-fold increase obtained by growth in the presence of 15 millimole potassium nitrate. Alkaline phosphatase activity varied 20fold, lowest activity with excess phosphate light-limited cells and highest activity with cells grown in the presence of 15 millimole potassium nitrate. was no correlation between hot water soluble phosphate of cells and alkaline phosphatase activity. Increasing the intensity of light 1.5 fold did not affect the yield of the algal cultures. The orthophosphate content of cells from the chemostats, throughout these experiments was in the range of 10-15% of the total phosphate input, and orthophosphate was never detected in the growth medium. (Jones-Wisconsin) W72-05476

OXYGEN REGIME OF THE SEA OF AZOV AND OXYGEN FORMATION CONDITIONS DURING REGULATED FLOW OF THE DON BURNIG REGULATED FLOW OF THE DON RIVER (KISLORODNYY REZHIM AZOV-SKOGO MORYA I USLOVIYA YEGO FOR-MIROVANIYA V PERIOD ZAREGULIROVAN-NOGO STOKA R. DON), AZOVSKII NAUCHNO-ISSIEdovatelskii Institut Ryb-

nogo Khozyaistva, Rostov-na-Donu (USSR). For primary bibliographic entry see Field 02K. W72-05502

INFECTIOUS PANCREATIC NECROSIS OF SALMONIDS IN ONTARIO,

Guelph Univ. (Ontario). Dept. of Microbiology.
R. A. Sonstegard, and L. A. McDermott.
Journal of the Fisheries Research Board of
Canada, Vol. 28, No. 9, p 1250-1351, September 1971. 1 tab, 5 ref.

Descriptors: \*Freshwater fish, \*Salmonids, \*Viruses, \*Isolation, Brook trout, Lake trout, Rainbow trout, Fish diseases, Fish hatcheries,

Identifiers: \*IPN virus, Splake, Salvelinus fon-tinalis, Salvelinus namaycush, Salmo gairdneri, Infectious pancreatic necrosis, Canada.

A survey was made to determine the prevalence of infectious pancreatic necrosis, caused by the IPN virus, in the Ontario provincial salmonid hatchery system. Brook, rainbow and lake trout were examined and the IPN virus isolated from brook trout in two of the six hatcheries studied. No histories of abnormal mortalities suggestive of IPN infection had been reported at any of the hatcheries. However, the virus caused 40 percent mortality when inoculated into brook trout obtained from a different source. (Holoman-Battelle) W72-05596

CADMIUM POISONING IN FUNDULUS HETEROCLITUS (PISCES: CYPRINODON-TIDAE) AND OTHER MARINE ORGANISMS, National Marine Water Quality Lab., West Kingston, R. I.

Journal of the Fisheries Research Board of Canada, Vol 28, No 9, p 1225-1234, September 1971. 3 fig, 5 tab, 25 ref.

Descriptors: \*Bioassay, \*Toxicity, \*Fish, \*Marine animals, \*Lethal limit, Water quality, Cadmium radioisotopes, Chemical wastes, Absorption, Water temperature, Copper, Estuarine environ-ment, Shrimp, Crabs, Clams, Killifishes, Mussels, Minnows, Salinity, Heavy metals.

Identifiers: \*Cadmium, Atomic absorption spectrophotometry, Fundulus heteroclitus, Lethal age, Biological samples, Tautoga onitis, Mummichogs, Zinc, Cragnon septemspinosa, Pagurus longicarpus, Palaemonetes vulgaris, Starfish, Tautog, Asterias forbesi, Mya arenaria, Green crab, Carcinus maenus, Atlantic oyster drill, Urosalpinx cinerea, Eastern mud snail, Nassarius obsoletus, Sandworm, Nereis virens, Fundulus majalis, Mytilus edulis, Sheepshead, Cyprinodon Mytilus edulis, Shee variegatus, Soft-shell clam.

Since wastes containing cadmium salts are discharged into the oceans and may eventually pass into humans via seafoods, investigations were made into the effects of cadmium on marine organisms. Specifically, the toxicity of cadmium chloride to mummichogs (Fundulus heteroclitus) and other marine organisms was determined. Additional tests were conducted on mummichogs to determine the effects of salinity and temperature of the medium on cadmium toxicity, on posttreatment mortality after immersion in sublethal concentrations of cadmium, and on cadmium residues during and after immersion in solutions containing various concentrations of cadmium. In acute toxicity bioassays with cadmium chloride at 20 C and 2.0 percent salinity, the concentrations fatal to 50 percent of the organisms of various marine species in 96 hr ranged between 0.32 and 55.0 mg/liter cad-mium ion. The order of sensitivity was: sand shrimp, Crangon septemspinosa (0.32); hermit crab, Pagurus longicarpus (0.32); grass shrimp, Palaemonetes vulgaris (0.42); common starfish, Asterias forbesi (0.82); common soft-shell clam, Mya arenaria (2.2); green crab, Carcinus maenus (4.1); atlantic oyster drill, Urosalpinx cinerea (6.6); eastern mud snail, Nassarius obsoletus (10.5); sandworm, Nereis virens (11.0); striped killifish, Fundulus majalis (21.0); blue mussel, Mytilus edulis (25.0); sheepshead minnow, Cyprinodon variegatus (50.0); and mummichog, Fundulus heteroclitus (55.0). Mummichogs were more susceptible to cadmium exposures at 20 C than at 5 C and at 0.5 percent salinity than at 1.5, 2.5, or 3.5 percent. Additional studies with mummichogs clearly demonstrated that 96 hr was not sufficient to adequately evaluate cadmium toxicity to this species. Mummichog whole body cadmium residues determined by atomic absorption provided a useful index of cadmium body burden among fish surviving exposure. However, cadmi-um residue data from dead mummichogs were of limited worth owing to accumulation after death. (Holoman-Battelle)

DETERMINATION OF RESIDUAL FUEL OIL CONTAMINATION OF AQUATIC ANIMALS, Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station. For primary bibliographic entry see Field 05A. W72-05606

EUTROPHICATION (THE AGEING OF LAKES), A FLORIDA WATER QUALITY PROBLEM. Florida Dept. of Air and Water Pollution Control,

Tallahassee.

1971 8 P

Descriptors: \*Eutrophication, Nutrients, \*Florida, Water quality, Waste water treatment, Recharge, Groundwater, Irrigation, Effluents. Identifiers: Lake Apopka (Fla).

The causes and effects of eutrophication are reviewed briefly and means of controlling nutrient discharge into lakes are suggested. These fall into two major categories--waste water treatment to remove nutrients and the use of waste effluents for irrigation of watering purposes. (Mortland-Batteile) W72-05607

### Group 5C-Effects of Pollution

ALGAL DISTRIBUTION IN SIX THERMAL SPRING EFFLUENTS, Southeast Missouri State Coll., Cape Girardeau.

Dept. of Biology.
For primary bibliographic entry see Field 05B.

W72-05610

POLLUTION: CHEMICAL POLYCHLORINATED BIPHENYLS, For primary bibliographic entry see Field 05B.

POLYCHLORINATED BIPHENYLS: TOXICITY TO CERTAIN PHYTOPLANKTERS,

State Univ. of New York, Stony Brook. Marine Sciences Research Center.

J. L. Mosser, N. S. Fisher, T. C. Teng, and C. F.

Science, Vol 175, No 4018, p 191-192, January 14, 1972. 1 fig, 18 ref.

Descriptors: \*Polychlorinated biphenyls, \*Algae, \*Water pollution effects, \*Pesticides, Diatoms, Phytoplankton, Toxicity, Cultures, DDT, Growth

Identifiers: Thalassiosira pseudonana, Skeletonema costatum, Dunaliella tertiolecta, Euglena gracilis, Chlamydomanas reinhardtii, Lethal dosage.

Polychlorinated biphenyls (PCBs) and DDT were added to cultures of five species of unicellular algae to investigate their effects on growth rate. The growth rates of two centric diatoms (Thalassiosira pseudonana and Skeletonema costatum) were reduced by PCB concentrations as low as 25 ppb for the former and 10 ppb for the latter. For both these species, PCBs were more toxic than the equivalent amount of DDT. By contrast, a marine green algae (Dunaliella tertiolecta) and two freshwater algae (Euglena gracilis and Chlamydomonas reinhardtii) were not inhibited at these, or higher, concentrations. This sensitivity paralleled that to DDT. (Mortland-Battelle) W72-05614

BIOLOGICAL DEGRADATION OF MINERAL

OIL IN SEA WATER, Koninlijke/Shell-Laboratorium, (Netherlands). For primary bibliographic entry see Field 05B.

PREURBANIZATION RECONNAISSANCE STUDY OF LAKE EARL, DEL NORTE COUN-

TY, CALIFORNIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02H. W72-05646

AN INVESTIGATION OF PRIMARY PRODUC-TIVITY USING THE 14C METHOD AND AN ANALYSIS OF NUTRIENTS IN ELEPHANT BUTTE RESERVOIR, New Mexico State Univ., University Park. Water

Resources Research Inst. D. E. Kidd, and G. V. Johnson.

Available from the National Technical Informa-tion Service as PB-207 351, \$3.00 in paper copy, \$0.95 in microfiche. Technical Completion Report, 1971, 136 p, 11 fig, 14 tab, 28 ref, append. OWRR A-021-NMEX (1).

Descriptors: \*Ecosystems, \*Eutrophication, \*Turbidity, \*Microorganisms, \*Primary productivity, \*Lakes, New Mexico, Water properties, Water pollution effects, Biochemistry, Carbon radioisotopes, Nitrates, Phosphates, Sediment dis-Reservoir silting, Reservoir silting, Reservoir stages.

Identifiers: \*Elephant Butte Reservoir (Nex),

\*Phytoplankton, Algal population.

An investigation of the phytoplankton population structure, primarily productivity and the concentrations of the nutrients nitrate and phosphate was conducted in Elephant Butte Reservoir, New Mexico during 1970. Surface, one, and two meter samples were obtained at weekly or biweekly intervals at five stations extending from the outlet near the dam to the inlet of the Reservoir. This transect represented a gradient of increasing sediment load and decreasing transparency from the outlet to the inlet of the reservoir. Diversity and redundancy indexes were computed using counts obtained for 70 phytoplankton species identified. Significant correlations of diversity with temperature, productivity, and algal number were obtained while diversity was negatively correlated with depth and storage. It was apparent that the reservoir consisted of a lower and upper pool, the lower having a lower silt load and hence greater transparency, lower numbers of phytoplankton, lower primary productivity at the surface, lower concentrations of nitrate and phosphate, and generally more stable conditions. The nitrate concentration increased as storage decreased and the phosphate concentration increased with temperature. These correlations along with the high productivity during the warmer months when storage is decreasing indicate the need for maintence of a minimum pool size to avoid possible algal blooms. (Creel-New Mexico State) W72-05687

FAUNA OF THE U.S.S.R., TRICHOPTERA, LARVAE AND PUPAE OF ANNULIPALPIA, Nauk SSSR.

Zoologicheskii Institut.
For primary bibliographic entry see Field 05A. W72-05689

EVAPOTRANSPIRATION REDUCTION, Meteorological Office, Poona (India). For primary bibliographic entry see Field 03B.

PRELIMINARY SURVEY OF HEAT METAL CONTAMINATION OF CANADIAN FRESH-

WATER FISH, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. J. F. Uthe, and E. G. Bligh. J Fish Res Bd Can. 28 (5): 786-788. 1971.

Identifiers: Canadian, Contamination, Fish, ·Fresh, Heavy, Metal, Survey.

The concentrations of 13 toxic elements in dressed fish from a nonindustrialized and heavily industri-alized freshwater area were measured. With the exception of Hg, in no instance did levels exceed limits set by regulatory agents for Pb, As, Cu, and Zn. Indeed in the majority of instances the levels from the industrialized area did not differ significantly from those of the nonindustrialized area.--Copyright 1971, Biological Abstracts, Inc. W72-05712

FREQUENCY OF ANIMAL BOTULISM OF WATER ORIGIN IN SENEGAL, (IN FRENCH), Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux, Fort-Lamy (Chad).

Rev Elevage Med Vet Pays Trop. 22 (1): 29-31. 1969. (English summary).

Identifiers: Animal, Botulism, Cow, Frequency, Horse, Mammal, Origin, Senegal, Sheep.

Three cases of animal botulism (cows, horses, sheep) caused by drinking of water from wells contaminated by corpses of small mammals are reported. A hypothesis concerning the origin of the outbreak observed since 1959 is expressed .-- Copyright 1971, Biological Abstracts, Inc. W72-05715

STUDIES ON THE OPEN AIR BIOLOGY OF SALMONELLAE IN THE REGION OF THE WESER-LEINE RIVERS 1964-67,

Niedersaechsiches Landesmuseum (West Germany).

U. Luttmann. Gesundheitsw Desinfek. 59 (12): 180-186. 1967. Identifiers: Air, Biology, Bird, Leine, Open, Rivers, Salmonella-Paratyphi, Salmonella-Typhimurium, Salmonellae, Weser.

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The desirability of admitting the strongly polluted waters of the river Leine in Germany to the waters of Steinhuder Lake due to a connection of the 2 bodies by a canal and dam (which could be opened when the cities and countryside along the Leine were threatened by high water) was discussed. Salmonellae populations in the river and in the lake were studied to establish the ability of each to purify itself. The ability of the Leine to purify itself of contamination was relatively poor, while the Steinhuder Lake, by itself, can get rid of salmonel-lae deposited by migratory birds. The canal could be built and it could then be determined whether the ecology of the lake would suffer by the inflow of Leine water. The salmonellae of most concern are Salmonella paratyphi B and S. typhimurium.— Copyright 1971, Biological Abstracts, Inc. W72-05802

AGRICULTURAL RUNOFF - A BIBLIOG-

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

For primary bibliographic entry see Field 05B. W72-05840

### 5D. Waste Treatment Processes

WET WASTE DISPOSAL METHOD, AP-PARATUS AND COMPONENTS, General Incinerators of California, Inc., San

R. B. Burden, Jr., and E. J. O'Gieblyn. U.S. Patent No. 3,491,708, 7 p, 4 fig, 9 ref. Official Gazette Vol 870, No. 4, p. 1150, January 27, 1970.

Identifiers: Rotary dryers, \*Wet wastes.

Descriptors: \*Patents, \*Sewage sludge, \*Sewage disposal, \*Drying, Separation techniques, \*Solid wastes, Waste treatment, Burning, \*Incineration, Pollution abatement.

A rotary dryer predries wet waste. The dryer includes a circular horizontal conveyor table which rotates at slow speed on a central shaft and an an-nular gas chamber which is mounted over an outer peripheral portion of the table so that the table forms the bottom wall of the chamber. Plow devices slowly stir the material as it moves to promote drying. After the furnace gases pass through the gas chamber, they are led into a gas scrubber and then to an afterburner, after which they are discharged to the atmosphere. The system destroys wet wastes such as sewage sludge, gar-bage, wood chips, paper, and general refuse. (Sin-ha-OEIS) W72-05295

METHOD AND APPARATUS FOR SEPARAT-

ING WATER AND OIL, Standard Oil Co. of Indiana, Chicago, Ill. For primary bibliographic entry see Field 05G. W72-05297

MODULAR UNIT ASSEMBLY FOR MULIT-STAGE FLASH DISTILLATION, American Machine and Foundry Co., New York. For primary bibliographic entry see Field 03A. W72-05298

SEWERAGE TREATMENT PLANT, Convert-All, Inc. (Assignee).

### Waste Treatment Processes—Group 5D

J. Koulovatos. U. S. Patent No. 3,487,937, 3 p, 2 fig, 11 ref. Vol. 870, No. 1, Official Gazette p. 140, January 6,

Descriptors: \*Patents, Sewage treatment, \*Domestic wastes, Water pollution treatment, \*Aeration, \*Chlorination, Sewage disposal, Waste water disposal, \*Waste water treatment.

Identifiers: \*Ultra-violet treatment.

A domestic sewage treatment plant consists of four sections arranged in series to receive sewage. The first and third sections consist of settling tanks. Means are provided to aerate the contents of the second section and to deliver sludge. Means for chlorination (tablets) and ultra-violet treatment are included. (Sinha-OEIS) W72-05301

SEWAGE TREATMENT PROCESS, FMC Corp., San Jose, Calif. (Assignee). G. W. Reid. U. S. Patent No. 3,623,977, 7 p, 2 fig, 6 ref. Official Gazette, Vol. 892, No. 5, p. 1799, November 30, 1071

Descriptors: \*Patents, Sewage treatment, \*Oxida-tion, \*Aeration, Separation techniques, \*Waste water treatment, Pollution abatement, Biochemi-cal oxygen demand.

Simultaneous comminution and oxidation of waste Simultaneous comminution and oxidation of waste suspended in an aqueous medium is achieved while the waste is held under flow equalizing and BOD equalizing conditions. Preheated aqueous waste is withdrawn from the oxidizing zone for delivery to a radiant heating zone to a temperature level for pasteurization of the waste. In the radiant heating zone the aqueous portion is vaporized. Inert solids, gas mixtures, and vapor are separately discharged. (Sinha-OEIS) W72-05303

### EFFLUENT DISPOSING SYSTEM,

F. J. Munson. U. S. Patent No. 3,490,485, 4 p, 3 fig, 9 ref. Official Gazette Vol 870 No 3, p. 836, January 20, 1970.

Descriptors: \*Patents, \*Sewage disposal, \*Waste water disposal, Diffusion, Seawater, Ocean currents, Pollution abatement, Water pollution control, Dispersion, \*Effluents. Identifiers: \*Ocean outfalls, \*Outfalls.

A system for disposing sewage into the ocean or A system for disposing sewage into the ocean or any large water body consists of a long outfall which extends from a sewage processing plant into the ocean. At the end of the outfall orifices discharge the effluent into diffusers aligned with the orifices. The diffusers are spaced a predetermined distance from the orifices to entrain sea water with the effluent as it is forced under presure into the diffusers. Opening in the diffusers sure into the diffusers. Openings in the diffusers let the sewage and sea water intermix before entrance into the ocean. (Sinha-OEIS) W72-05305

# AERATION DEVICE FOR SEWAGE PLANTS WITH BIOLOGICAL PURIFICATION,

M. Danjes, and A. Schreiber. U. S. Patent No. 3,490,752, 7 p, 11 fig, 8 ref. Official Gazette Vol 870, No 3, p. 903, January 20,

Descriptors: \*Patents, \*Aeration, Sewage treatment, Water purification, \*Biological treatment, Filters, Air entrainment, Bubbles, \*Membranes, \*Westerweithers Waste water treatment. Identifiers: \*Oxygen enrichment, Air bubbles.

An apparatus introduces fine air bubbles into the sewage and waste water of a treatment plant. The biological purification with air treatment is ef-fected by impulse-like connection and disconnec-tion from a compressed air source. The apparatus has a membrane means to separate it into two sections. (Sinha-OEIS)

W72-05306

### METHOD AND APPARATUS FOR NON--CYCLIC CONCENTRATION OF SOLUTION-SUSPENSION.

M. G. Huntington. U. S. Patent No. 3,491,021, 7 p, 9 fig, 6 ref. Official Gazette Vol 870 No 3, p. 960, January 20, 1970.

Descriptors: \*Patents, Separation techniques, Water purification, \*Filtration, \*Membranes, \*Fil-ters, \*Waste water treatment. Identifiers: \*Ultrafiltration, Pressurized filtration.

Turbid liquids are clarified in a non-cyclic, con-Turbid liquids are clarified in a non-cyclic, continuous manner and no filter cake accumulates. The apparatus includes an annular cylindrical housing that encloses a plurality of spaced and individually sealed concentric assemblies which carry membranes on laterally permeable supports between concentric cylindrical pressure shells. The apparatus is oscillated about a longitudinally central axis by reciprocating angular acceleration relative to the inertially positioned solution-suspension. This action produces an alternating shearing force between the fluid boundary layer and the membrane surface. (Sinha-OEIS) W72-05307

#### LIQUID WASTES TREATMENT METHOD, Del-Pak Media Corp. (Assignee).

J. O. Cessna.

U.S. Patent No. 3,623,976, 6 p, 2 fig, 2 tab, 8 ref. Official Gazette, Vol. 892, No. 5 p. 1798, November 30, 1971.

Descriptors: \*Patents, \*Liquid wastes, \*Biological treatment, \*Filters, Waste water, \*Waste water treatment, Filtration, Pollution abatement. Identifiers: \*Biological filters.

A biological filter is formed to allow heavy biochemical oxygen demand loading and a means to recycle substantial quantities of aerobic sludge from a secondary clarifier for distribution over the biological filter, without detaining the sludge for aeration, to create an activated floc in the filter. The filter media is preferably an array of elongated lathes formed to provide a multiplicity of horizontally oriented surfaces on which activated floc will form. (Sinha-OEIS) W72-05308

### DISTILLATION SYSTEM AND METHOD, For primary bibliographic entry see Field 03A. W72-05309

SKIMMER FOR SEPARATING FLOWING LIQUIDS FROM WATER, For primary bibliographic entry see Field 05G.

W72-05310

# DEWATERING OF SEWAGE SLUDGE,

DEWATERING OF SEWAGE SLODDE, BSP Corp., Brisbane, Calif. (Assignee). P. J. Cardinal, Jr. U. S. Patent No. 3,623,438, 5 p., 1 fig. 9 ref. Official Gazette, Vol. 892, No. 5, p. 1676, November 30,

Descriptors: \*Patents, Sewage sludge, Sludge disposal, \*Incineration, \*Dewatering, Separation techniques, \*Waste water treatment, Sewage treatment, \*Tertiary treatment, Pollution abate-

Identifiers: \*Batch dewatering.

Excess liquid is removed from sewage sludge produced in a tertiary or similar sewage studies plant. Sludge is dewatered by centrifugal action, the dewatered sludge is subsequently incinerated for disposal or selective reuse. The system infor disposal or selective reuse. The system reludes a batch-type dewatering device, a collector and a means for feeding a continuous stream of dewatered sludge from the collector into an incinerator. (Sinha-OEIS)

#### SEWAGE TREATMENT PROCESS,

Sonetics, Inc. (Assignee). O. R. Waltrip.

U. S. Patent No. 3,625,884, 5 p, 2 fig, 2 tab, 4 ref. Official Gazette, Vol. 893, No. 1, p. 254, December 7, 1971.

Descriptors: "Patents, "Sewage treatment, "Organic compounds, "Ionization, Filtration, Separation techniques, Pollution abatement, "Waste water treatment.

Identifiers: "Audiofrequency energy, Selective disagnession."

dissociation.

A method and apparatus are described for the selective dissociation of chemical compounds in a a medium containing such compounds in a solution or colloidal suspension. By injecting audiofrequency energy and ionizing the sewage, the contaminants and pollutants are rendered harmless. (Sinha-OEIS)
W72-05313

#### REMOVAL OF OIL FROM WATER,

AMF Co., New York (Assignee). For primary bibliographic entry see Field 05G. W72-05314

LIQUID WASTE TREATMENT PROCESS, J. M. Valdespino. U. S. Patent No. 3,625,883, 5 p, 3 fig, 11 ref. Offi-cial Gazette, Vol. 893, No. 1, p. 254, December 7,

Descriptors: \*Patents, \*Waste water treatment, \*Liquid wastes, Sewage treatment, Separation techniques, \*Chemical wastes, Industrial wastes. Chlorination, Phosphates, Nitrates, Filtration, Pollution abatement, Algae, Nutrient,
\*Biodegradation, Water purification, \*Aerobic
treatment, \*Oxidation lagoons.
Identifiers: Aerobic biological degradation.

A method is described for the treatment of liquid waste from domestic and industrial sources. The waste from domestic and industrial sources. The liquid waste is first fed to a comminutor for chopping and mixing solid waste with the liquid. The product is then fed to a surging tank for providing an intermittent flow into a centrifuging step. The waste is centrifuged through a filter medium such as sand or diatomaceous earth. The separated effluent is fed to an oxidation lagoon for serobic biological desengation. The separation of aerobic biological degradation. The generation of algae may be provided to remove phosphates, nitrates and other nutrients. The effluent then is fed to a second centrifuge filter to separate remaining solids which are burned. Chlorination provisions are included. (Sinha-OEIS) W72-05315

#### OIL RECLAIM CURTAIN,

For primary bibliographic entry see Field 05G. W72-05317

### WATER CLARIFIER AND SEPARATOR,

Petrolite Corp., St. Louis, Mo. (Assignee). L. C. Waterman.

U. S. Patent No. 3,623,608, 7 p, 3 fig, 1 ref. Official Gazette, Vol. 892, No. 5, p. 1717, November 30,

Descriptors: \*Patents, \*Oil wastes, \*Separation techniques, Flotation, Water purification, Waste gases, Water pollution treatment, Pollution abatement, Oily water, Chemical wastes, Liquid wastes, \*Waste water treatment. Identifiers: \*Oil pollution abatement, Gas flotation, \*Clarifier.

Oil-contaminated water can be treated to separate the oil from the water in a clarifier closed from the atmosphere. The water is clarified by gas flotation. The closed vessel has an upper-inclined wall that guides the oily wastes material to a collection zone. (See also W72-05319) (Sinha-OEIS)

### **Group 5D—Waste Treatment Processes**

CLARIFYING OIL-CONTAMINATED WATER BY FLOTATION IN A CLOSED SYSTEM, I., D. Waterman.

U. S. Patent No. 3,625,882, 7 p, 3 fig, 4 ref. Official Gazette, Vol. 893, No. 1, p. 253, December 7,

Descriptors: \*Patents, \*Oil wastes, Separation techniques, \*Flotation, Water purification, Waste gases, Water pollution treatment, Pollution abatement, Oily water, Chemical wastes, Liquid wastes, Waste water treatment.

Identifiers: \*Oil pollution abatement, \*Gas flotation \*Coefficier\*

tion, \*Clarifier.

Oil-contaminated water can be treated to separate the oil from the water in a clarifier closed from the the on from the water in a clarifier closed from the atmosphere. The water is clarified by gas flotation. The enclosed vessel is an upper-inclined wall that guides the oily wastes material to a collection zone. (See also W72-05318) (Sinha-OEIS)

MAN AND HIS ENVIRONMENT, VOL. 3. WASTE, For primary bibliographic entry see Field 05G.

FLOATING BOOM.

For primary bibliographic entry see Field 05G. W72-05404

MEASUREMENTS OF THE INTENSITY OF FLOW AND LEVEL OF SEWAGE AND SEDI-MENTATION IN A MODERN SEWAGE TREAT-

MENT PLANT,
Polish Association of Sanitary Engineering and
Technology, Warsaw.

Jerzy Komorek. Gaz Woda Tech Sanit. 44 (9): 300-304. 1970. Illus. Identifiers: Cotton-D, Fats, Flow, Hair, Intensity, Measurements, Oil, Plant, Rags, Sedimentation, Sewage, Soap, Treatment.

These measurements meet with difficulties due to the very variable composition of sewage containing fats, soap, oils, hair, rags, cotton and other suspensions showing a variable degree of dispersion. Methods are presented for measuring the level of sewage and intensity of flow, which gave very good results.—Copyright 1971, Biological Abstracts, Inc. W72-05408

TREATMENT OF SEWAGE AND EVALUATION IN AGRICULTURAL AREAS FROM A HY-GIENIC POINT OF VIEW, Ernst-Moritz-Arndt Univ., Greifswald (East Ger-

many). Hygiene-Institut. H. Knabe, M. Poch, G. P. Schmidt, S. Schwarz,

and S. Zunk.

Z Gesamte Hyg Grenzgeb. 17 (4): 257-261. 1971

(English summary).
Identifiers: Agricultural, Animal, Fat, Hygienic, Oil, Oxidation, Point, Ponds, Sewage, Treatment,

Starting from the prognostic development of the agricultural areas, and particularly of the big plants for animal production, a critical assessment of sewage treatment and utilization from the hy-gienic point of view is made. Plants for partial and complete biological sewage treatment, especially the oxidation and stabilization ponds, are of great advantage for the treatment of fouled sewage, oils advantage for the treatment of fouled sewage, oils and fats, silo seepages and liquid manure. A preliminary biological treatment seems to be necessary because special types of parasites are subject to a regular change of host and the sewage may promote their spreading. Spray irrigation of sewage, which is the main form of the utilization of sewage in the agricultural areas, is discussed. Suggestions for improving convertion between Suggestions for improving cooperation between hygienists, experts in water economy, technicians, and agriculturists, are made.--Copyright 1971, Biological Abstracts, Inc. W72-05410

THE REMOVAL OF DISSOLVED RADIO-ELEMENTS IN THE TREATMENT OF WATER WITH FLOCCULATING AGENTS,

Institutul de Igiena, Iasi (Rumania). Bakteriol. Lab. Kommunalhyg. H. Weissbuch, A. Cotrau, and P. Velicescu.

Z Gesamte Hyg Grenzgeb. 15 (10): 761-763. 1969.

Illus. (English summary).
Identifiers: Aluminum, Cesium, Contamination, De, Dissolved, Elements, Flocculating, Radio, Strontium, Sulfate, Treatment.

The classical procedure of treating surface waters by means of aluminum sulfate enables the isolation of soluble U. salts from surface waters. It does not, however, influence the soluble content of radio-Sr and of radio-Cs. When the process of decontamination takes place (U) the decantation period of 1 hr is sufficient to achieve an effective decontamination.—Copyright 1971, Biological Abstracts Inc. W72-05411

PROCESS FOR THE CLARIFICATION OF WASTE EFFLUENTS,
General Mills, Inc., Minneapolis, Minn. (As-

David L. Kieper, and Stephen S. Treichel. U. S. Patent No. 3,498,912, 3 p, 2 tab, 6 ref; Patent Abstracts Section, Official Gazette, Vol 872, No 1, p 270, March 3, 1970.

Descriptors: \*Patents, \*Biochemical oxygen de-mand, \*Industrial wastes, Suspended solids, \*Waste water treatment, \*Sewage treatment, Pollution abatement, Water pollution treatment. Identifiers: Clarification.

Raw sewage or industrial effluents are treated with a combination of a cationic derivative of a polygalactomannam gum and a polyvalent metal ion to remove suspended solids and reduce the biological oxygen demand of the sewage. (Sinha-OFIS) W72-05418

ELECTRONIC WATER PURIFIER,

Ruffin Industries, Inc. (Assignee). For primary bibliographic entry see Field 05F. W72-05431

ACTIVATED SLUDGE ATP: EFFECTS OF EN-VIRONMENTAL STRESS,

Florida Univ., Gainesville. Dept. of Environmen-

tal Engineering.
P. L. Brezonik, and J. W. Patterson. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA 6, p 813-824, December 1971. 6 fig, 3 tab, 26

Descriptors: Waste water treatment, Biochemical Descriptors: Waste water treatment, Biochemica oxygen demand, \*Biomass, Indicators, \*Activated sludge, Sludge treatment, Cultures, Enzymes, Respiration, Chemical oxygen demand, Bioluminescence, Metabolism, Temperature, \*Heavymetals, \*Water pollution effects, Copper, Industrial wastes, Waste water treatment, E. coli, Toxica Bisicalisates. ins, Bioindicators.

ins, Bioindicators.
Identifiers: \*Adenosine triphosphate, Luciferase, Dehydrogenase, Cyanides, Nickel, Mercury, Phosphorylation, Aerobacter aerogenes, Streptococcus faecalis, Bacillus subtilis, Pseudomonas fluorescence, Survival.

A study was undertaken to determine the response of sludge ATP to stresses imposed on the sludge environment and to demonstrate the utility of ATP measurements in determining changes in sludge activity. It was concluded from the experiments that ATP is a specific measure of sludge activity. Under constant environmental conditions, it can be used to estimate viable biomass in sludge. Mea-surements of ATP under varying environmental conditions indicate that activated sludge is relatively insensitive to abrupt temperature changes up to about 37 degrees C and that activated sludge

organisms can withstand anoxic conditions without loss in viability for at least short (several hours) periods of time. The ATP content per cell is affected by substrate loading. ATP is also a sensitive and rapid indicator of toxic stress by heavy metals and industrial waste toxicants, such as mer-cury, nickel, copper, and cyanide, in activated sludge, and therefore may be useful as a means of monitoring biomass in waste treatment plants containing industrial effluents. (Jefferis-Battelle) W72-05443

INTEGRATED APPROACH TO PROBLEM OF VIRUSES IN WATER, Federal Water Quality Administration, Concin-nati, Ohio. Advanced Waste Treatment Research

For primary bibliographic entry see Field 05F. W72-05444

EFFLUENT STRUCTURE,

George D. Newton, Sr. U.S. Patent No. 3,501,918, Patent Abstracts Section, Official Gazette, Vol 872, No 4 p 1092, March 24, 1970. 2 p, 4 fig, 3 ref.

Descriptors: \*Patents, \*Waste water treatment, \*Stabilization, Water levels, \*Liquid wastes, Water pollution control, Treatment facilities, Pollution abatement, Water quality control, Ponds, Water purification, Effluents. Identifiers: \*Waste stabilization ponds.

The structure for controlling water level in a waste stabilization pond consists of a vertical hollow stanuzation pond consists of a vertical nonlow column with an elongated vertical opening. A gate plate with a V-notch weir is mounted over the opening. The water in the pond flows through the weir into the column and leaves the column through a drain pipe. The position of the weir sets the water level in the pond. The clarified water is then drained either into another treatment pond or into local streams or rivers. (Sinha-OEIS) W72-05451

DISTILLATION-CONDENSER WITH VERTI-

CALLY DISALIGNED TUBES, Saline Water Conversion Corp., Oradell, N.J. (Assignee).

For primary bibliographic entry see Field 03A. W72-05455

PHYTOPLANKTON ENERGETICS IN A SEWAGE-TREATMENT LAGOON, Southern Illinois Univ., Carbondale. Dept. of

Botany.
Jacob Verduin.
Ecology, Vol 52, No 4, p 626-631, 1971. 5 fig, 3 tab, 20 ref. NSF GE-2649.

Descriptors: \*Phytoplankton, \*Metabolism, \*Sewage treatment, \*Sewage lagoons, Ohio, Oxygen, Dissolved oxygen, Light, Diffusivity, Carbon dioxide, Light intensity, Photosynthesis, Equations, Light penetration, Algae, Hydrogen ion concentration.

Identifiers: Extinction coefficient, Lambert-Beer equation, Eddy diffusivity, Deshler (Ohio).

Intensive investigations were carried out from March 21 through June 10, 1964 of a sewage-treatment lagoon system near Deshler, Ohio--a period critical for sewage ponds in the temperate zone. The ponds were well mixed vertically, exhibited daytime average eddy diffusivities of about 1 sq cm/sec and had a high titratable base. Low oxygen levels were encountered for only a short period in the second stage of the two-pond system. Light absorption averaged about 90%/m. The phytoplank-ton communities, dominated by Scenedesmus, rose to 50 microliters/l. Rates of carbon dioxide uptake in the order of 1 M/cm per day were observed, but oxygen production averaged only 1/5 as high. A graph of carbon dioxide uptake versus light intensity revealed a curve closely similar in

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### Waste Treatment Processes—Group 5D

shape to the typical photosynthesis versus light curve, but a spearate set of data, based on C-14 uptake, showed anomalously high values at surface light intensities. Carbon dioxide uptake by a photosynthetic metabolic process that does not produce oxygen is postulated to explain the imbalance between carbon dioxide and oxygen budgets. (Jones-Wisconsin) W72-05459

COMPUTER-SIMULATION STUDY OF PREDATOR-PREY RELATIONSHIPS IN A SIN-GLE-STAGE CONTINUOUS-CULTURE

SYSTEM, Water Pollution Research Lab., Stevenage (En-

gland). C. R. Curds.

Water Research, Vol 5, p 793-812, 1971. 1 tab, 15 fig. 16 ref.

Descriptors: \*Sewage treatment, \*Computer models, \*Predation, \*Cultures, Bacteria, Microorganisms, Food chains, Nutrients, Protozoa, Population, Dynamics, Kinetics, Growth rate, Saturation, Simulation analysis, Activated sludge, Mathematical models, Computer programs. Identifiers: \*Predator-prey relationships, \*Continuous culture systems, Population dynamics, Tetrahymena pyriformis, Klebsiella aerogenes, Chemostat, Dilution rate.

Development of a mathematical model for cilitated protozoa feeding on bacteria as the sole food supply and the use of digital computer simulation techniques to analyse the stability of bacterial and holozoic ciliate populations growing together in a single-stage continuous-culture apparatus is described. In the simple food chain considered, it was assumed that a soluble nutrient was continuously supplied to a population of bacteria which in turn was utilized by a population of holozoic ciliated protozoa. The population dynamics of this model system were investigated by digital com-puter simulation. Results of an earlier experimental study on the ciliate Tetrahymena pyriformis and the bacterium Klebsiella aerogenes were used as basis for the simulation studies. Limit-cycle (unstable focal point) oscillations of the three population variables, substrate, bacteria, and ciliates, were generally observed, but at high dilution rates steady-state conditions were established. Steady-state values were approached either via damping oscillations (stable focal point) or via non-oscillatory variations (stable nodal point) whereby the populations asymptoted to steady-state values. Effects of the magnitude of the kinetic constants, the maximum specific growth rate, and the saturation coefficient, of both predator and prey, were investigated by computer simulation. (Jones-Wisconsin) W72-05462

#### APPARATUS FOR BIOLOGICAL TREATMENT OF RAW WASTE WATER.

Lyco Systems, Inc., Williamsport, Pa. (Assignee).

Botho Bohnke

U.S. Patent No. 3,498,459, 2 p, 3 fig, 2 ref; Patent Abstracts Section, Official Gazette, Vol 872, No 1, p 167, March 3, 1970.

Descriptors: \*Patents, \*Biological treatment, \*Waste water treatment, \*Aeration, Water purification, \*Anaerobic digestion, Pollution abatement, Treatment facilities, Water quality control. Identifiers: \*Clarification apparatus.

The apparatus consists of a tank with a lower chamber serving as an anaerobic digestion space and an upper chamber serving as an aerobic ac-tivation space. The aeration device consists of a rotor rotating at the water surface in the upper chamber. A conduit leads into the effective zone of a second rotor for the supply of air. (Sinha-W72-05465

DISTILLATION PLANT,

Department of the Interior, Washington, D.C. (As-For primary bibliographic entry see Field 03A. W72-05468

DESALINATION APPARATUS AND PROCESS. McDonnell Douglas Corp., Santa Monica, Calif. (Assignee). For primary bibliographic entry see Field 03A. W72-05511

APPARATUS AND PROCESS FOR THE CON-TROLLED OSMOTIC SEPARATION WATER FROM SEA WATER, For primary bibliographic entry see Field 03A. W72-05512

# LOW PRESSURE DEGASSING OF FEED WATER IN MULTI-STATE FLASH EVAPORA-

Applied Research and Engineering Ltd., Durham (England) (Assignee). For primary bibliographic entry see Field 03A. W72-05513

FLASH DISTILLATION PARTITIONED Weir Westgarth Ltd., Glasgow (Scotland) (As-

signee). For primary bibliographic entry see Field 03A. W72-05514

AN INTEGRAL APPROACH TO URBAN WATER SUPPLY SYSTEMS, Kaiser Industries Corp., Oakland, Calif. For primary bibliographic entry see Field 06B.

#### GAO LOOKS AT THE WATER POLLUTION PROBLEM.

General Accounting Office, Washington, D.C. For primary bibliographic entry see Field 06E. W72-05567

THE MERRIMACK TAPES, Corps of Engineers, New York. North Atlantic Div

F. McGowan, M. R. Eigerman, and H. E.

Water Spectrum, Vol 3, No 4, p 9-18, Winter 1971-72. 3 photo, 3 fig.

Descriptors: \*Waste water treatment. \*Waste treatment, \*Water pollution, \*Water pollution control, \*Planning, Technology, Flexibility, Land use. Water reuse.

Identifiers: \*The Merrimack River, \*Regional wastewater management system, Army Corps of Engineers, Alternatives, Solutions, Centraliza-tion, Decentralization, Institutional complexity, Urban and rural development, Renovated water.

This article represents comments by some participants in the Army Corps of Engineers study of alternative regional wastewater management system for five of the Nation's largest metropolitan areas. The Merrimack River is the test case presented. wastewater management system This river is now gravely polluted and it has been studied for conventional waste treatment. The Corps investigation of advanced technologies could build on this previous examination and round out planning for this region. Some of the preliminary planning in the study is described. The study did not presume to offer the 'solution' but offered alternatives containing flexibility. Some of the broader planning considerations included: (1) centralization versus decentralization (2) institutional complexity (3) compatibility (4) urban and rural development (5) land use planning, and (6) reuses of renovated water. The authors conclude that wastewater must be regarded as a resource.

Disposal without environmental damage is no longer sufficient. The reuse of most of the constituents of wastewater, and imaginative uses for the effluent must be actively pursued. (Strachan-Chicago) W72-05577

EXPERIMENTS IN COALESCENCE BY FLOW THROUGH FIBROUS MATS, California Univ., Berkeley. Dept. of Chemical En-

gineering. L. A. Spielman, and S. L. Goren.

Research Report.45 p, 12 fig, 4 tab, 9 ref. OWRR-A-034-CAL (2).

Descriptors: \*Coalescence, \*Oily water, Oil, Flow rates, Wettability, Viscosity, Filtration, \*Waste water treatment, Filters.
Identifiers: Mats, Coulter counter.

A simple technique was developed for preparing oil-in-water suspensions with a wide range of characteristic drop sizes and comparatively narrow drop-size distributions. The technique was used to vary drop diameter in fibrous mat coalescence experiments. Using a fixed chemical composition, other factors were independently varied as follows: fiber diameter (3.5, 60, 12.0 microns), flow velocity (0.01-1.0 cm/sec), oil viscosity (44, 464 cp), and preferential wetting. A Coulter counting system was used to determine the droplet collection at steady state. Accompanying pressure drops were also measured. Single phase pressure drops were about 30 percent smaller than predicted by theory. As predicted by theory, pressure drops were independent of both incoming droplet size and oil viscosity. Unusual factors of the pressure-drop vs. flow rate curves were also as predicted. Empirical equations for aqueous-wetted and oil-wetted mats were developed by correlating a dimensionless filter coefficient against a dimensionless adhesion group. (Mortland-Battelle) W72-03600

MICROBIAL COMETABOLISM OF 2.4.5--TRICHLOROPHENOXYACETIC ACID,
Bowling Green State Univ., Ohio. Dept. of Biolo-

gy. For primary bibliographic entry see Field 05B. W72-05604

ANIMAL WASTE MANAGEMENT AND AS-SOCIATED ODOR CONTROL.
New York State Coll. of Agriculture, Ithaca.

Final Report: ARS- USDA, Cooperative Agreement No. 12-14-100-9767 (42), AWM 71-04, September 1, 1971, A.T. Sobel, editor. 69 p, 40 fig, 24 tab. 17 ref.

Descriptors: \*Farm wastes, \*Poultry, \*Odor, \*Drying, \*Waste treatment, \*Air pollution, Waste disposal, Waste water treatment, Analytical techniques, Gas chromatography.

Effects of velocity on the drying characteristics of chicken manure were investigated. Attempts were made to measure ammonia by gas chromatography. A rating method of odor evaluation was adapted to manure handling and treatment systems. The control of odor through manure management and the effectiveness of various devices for undercage drying were investigated. (See also W72-05681 thru W72-05685) W72-05680

REMOVAL OF WATER FROM ANIMAL MANURES, PART II: EFFECTS OF VELOCITY ON AIR DRYING,

Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering. A. T. Sobel.

In: Agricultural Waste Management and Associated Odor Control, Cornell University AWM 71-04, September 1, 1971. 10 p, 2 tab, 7 fig, 4 ref.

### **Group 5D—Waste Treatment Processes**

Descriptors: \*Farm wastes, \*Poultry, \*Drying, Waste storage, Odor. Identifiers: Air-drying manure.

Water can be removed from animal manures by mechanical, thermal, and absorptive means. Thermal removal was investigated by utilizing a thin layer of unheated air, and a very low or 'static' air velocity. The equilibrium moisture content of chicken manure is comparable with other agricul-tural hygroscopic materials. Effects of humidity on drying time are significant but sample variation has an effect similar to a plus or minus 15% relative humidity change. Temperature, configuration of manure, thickness, compaction, velocity of air, and the biological state of the manure also affects the drying rate. Exposure to drying on both sides had an effect on 1/4 in. thick manure samples for velocities less than 700 FPM, but the effect was insignificant for 1/8 in. samples. Velocities greater than 800 FPM did not appreciably reduce the drying time from that of the 800 FPM level. Drying times for velocities 800 FPM or greater were approximately 1/3 that for 'static' conditions. The time required to remove the last 0.9 percent of water was approximately 8 hours at 'static' conditions and 5 hours at the higher velocities. (See also W72-05680) (Schmitt-Iowa State)

MEASUREMENT OF MANURE GASES BY GAS CHROMOTOGRAPHY,

Illinois Univ., Urbana. Dept. of Agricultural Engineering. D. L. Day.

In: Agricultural Waste Management and Associated Odor Control, Cornell University, AWM 71-04, September 1, 1971. 6 p, 1 fig.

Descriptors: \*Farm wastes, \*Gas chromatography, \*Ammonia, \*Carbon dioxide, Methane, Hydrogen sulfide.

Identifiers: Varian Aerograph Model 200 Chromatograph, Porapak T, Porapak S, Porapak Q, Porapak R, Carle T.C. detector.

A combination of gas chromatograph equipment was sought to measure manure gases, specifically ammonia. Previous work had used both thermal conductivity and hydrogen flame detectors for measuring methane, hydrogen sulfide, and carbon dioxide. A setup using silica gel and molecular sieve columns in series was considered undesirable since the molecular sieve is suspected of permanently retaining CO2, NH3, and H2O. Experiments were conducted with a Varian Aerograph Model 200 Chromatograph with T.C. detector with a 1/8 in. X 8 ft. of 100-120 Porapak T column and a Carle T.C. detector with 1/8 in. X 8 ft. of 50-80 mesh Porapak Q in series with 1/8 in. X 8 ft. of 50-80 mesh Porapak R. Ultimately it was found that there was as much CO2 in a cylinder marked as 123 ppm NH3 and the balance N2 as in a CO2 cylinder marked as 0.49% CO2, 20.8 O2, and balance N2. This explained the identical elution time for the NH3 and CO2 cylinders. 123 ppm NH3 was below the detection level for the gas chromatograph setups. NH3 in the absence of CO2 was used in other tests. The thermal conductivity and hydrogen flame detector chromatographs were not very reliable for quantitative measurement of ammonia in the 2,000 to 12,000 ppm concentration range; the threshold level appears to be 1% or higher. (See also W72-05680) (Schmitt-Iowa State) W72-05682

OLFACTORY MEASUREMENT OF ANIMAL MANURE ODOR, Cornell Univ., Ithaca, N.Y. Dept. of Agricultural

Engineering.

In: Agricultural Waste Management and Associated Odor Control, Cornell University, AWM 71-04, September 1, 1971. 21 p, 12 fig, 7 tab, 11 ref.

Descriptors: \*Farm wastes, \*Poultry, \*Drying, Identifiers: Air-drying manure.

The gas chromatograph can detect compounds to 10-12g of any material, but odorous compounds below this level can be readily detected by the human nose. Consequently, an odor panel was created and asked to rate various manure samples as to the presence of odor, and the offensiveness of the odor. A scale of 0-10 was used with zero representing no odor and 10 representing a very strong and offensive odor. Samples included manure that was undiluted, diluted in various proportions, and manure that was dried to various moisture contents. The use of a rating method utilizing the human nose for odor evaluation provides valuable information for comparing manure handling and treatment systems. Ratings for odor presence and odor offensiveness are very similar.

Descriptive terms help in catagorizing odors. Olfactory observation along with visual observation produces a different rating in comparison with ol-factory observation only. Visual observation may introduce some bias. Since there is no right answer to an olfactory test, the test must be set up and run under conditions such that the results can be used for comparison only. (See also W72-05680) (Schmitt-Iowa State) W72-05683

CONTROL OF ODORS THROUGH MANURE MANAGEMENT,

Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.

Engineering.
D. C. Ludington, A. T. Sobel, and B. Gormel.
In: Agricultural Waste Management and Associated Odor Control, Cornell University, AWM 71-04, September 1, 1971. 17 p, 13 fig, 8 tab, 2 ref.

Descriptors: \*Farm wastes, \*Poultry, \*Drying, Identifiers: Air-drying manure.

Attempts to mask, counteract, or oxidize odors from manure have been largely unsuccessful. If odors cannot be controlled once they have been formed, an effort must be made to inhibit the production of odors. To evaluate the success of efforts to control odors a measuring device is needed. A panel of humans rating odor presence and offensiveness from 1 to 10 has been found the best device for evaluation. Experiments were conducted to check the influence of moisture removal and manure removal on the odor offensiveness of the gases released from chicken manure. Removing moisture reduced the odor level. Diluted manure always produced the highest offensiveness and undiluted manure the next highest. Daily scraping which did not allow buildup of manure was also a successful technique for controlling odor. A manure management system which either removes the manure from the building at least daily without manure buildup or removes moisture from the manure will cause a minimum amount of air pollution. (See also W72-05680) (Schmitt-Iowa State) W72-05684

UNDER CAGE DRYING OF POULTRY MANURE. Cornell Univ., Ithaca, N.Y. Dept. of Agricultural

Engineering.
B. Gormel, A. T. Sobel, and D. C. Ludington. In: Agricultural Waste Management and Associated Odor Control, Cornell University, AWM 71-04, September 1, 1971. 15 p, 7 fig, 7 tab.

Descriptors: \*Farm wastes, \*Poultry, \*Drying, Waste disposal, Odor. Identifiers: Air-drying manure.

Various means to achieve drying of poultry droppings before they could mat together into a solid mass were investigated. Fins made of different materials placed at various angles, screens, and rotating pins were investigated, with air move-ment at 3 to 4 cfm per bird. The moisture content of manure from caged layers was reduced to 50% by use of metal fins below the cages. Fins at more than 45 deg. angles caught a low percentage of the manure and thus, had small effect. Supplementary fins at 30 deg. beneath the 45 deg. fins were not self-emptying. Air circulation is of great im-portance in fin drying of poultry manure. Vertical fins will hold about 46% of the total manure when this will note about 49% of the total manufer when the fins are placed 3/4 in. apart. Half-inch ex-panded metal allowed too high a percentage of fresh droppings to pass into the pit to be a signifi-cant benefit in the drying process. Rotating pins reduced the moisture content to about 50% but something stronger than the 1/4 in. maple dowel 7 3/4 in. pins is needed. In these tests, drying took place partially on the devices such as screens, metal fins or spindles with significant additional drying of the crumbled manure occurring in the chamber pits because the devices prevented the formation of a solid mass of droppings in the pit. (See also W72-05680) (Schmitt-Iowa State)

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BARRIER FOR OIL SPILT ON WATER, British Petroleum Co. Ltd., London (England); and Low (Gordon) (Plastics) Ltd., London (England) (Assignees).
For primary bibliographic entry see Field 05G. W72-05708

BARRIER FOR OIL SPILT ON WATER, The British Petroleum Co., Ltd., London (England) (Assignee). For primary bibliographic entry see Field 05G. W72-05709

BARRIER FOR OIL SPILT ON WATER, British Petroleum Co. Ltd., London (England); and Low (Gordon) (Plastics) Ltd., London (England) (Assignees). For primary bibliographic entry see Field 05G.

FACTORS AFFECTING PH IN ALKALINE WASTEWATER TREATMENT: II. CARBON DIOXIDE PRODUCTION,
Technische Hogeschool Twente, Enschede

(Netherlands). L. Lijklema.

Water Research 5 (4): 123-142. 1971. Illus. Identifiers: Activated, Alkaline, Carbon, Di, Dynamics, Metabolism, Oxide, pH, Production, Quotient, Respiratory, Sludge, Thermo, Treatment. Waste water.

The CO2 produced during biological oxidation of wastewater has a pronounced influence upon the pH that is attained in the activated sludge process. The quantity produced is proportional to the COD (chemical O2 demand) removed, its degree of oxidation and the oxidation level of the substrate. A discussion of metabolism is given with emphasis on the O2 consumption. A mass balance for the metabolism of model compounds is presented. This model is based on a thermodynamic consideration of the metabolic process and offers a basis for calculation of RQ values. Experimental evidence for the applicability of this model is presented. Experimental results for a sewage are applied in pH calculations.—Copyright 1971, Biological Abstracts, Inc. W72-05718

EXPERIENCE WITH A BACTERIAL INOCU-LUM FOR USE IN RESPIROMETRIC TESTS FOR OXYGEN DEMAND, Water Pollution Research Lab., Stevenage (En-

gland).

For primary bibliographic entry see Field 05A. W72-05719

BIOLOGICAL ASPECTS OF WASTE AND SEWAGE COMBINED TREATMENT V
COMPLETE MIXING ACTIVATED SLUDGE. National Research Centre, Cairo (Egypt). Water Pollution Dept. Fatma A. El-Gohary. Water Research, 5 (3): 103-112. 1971. Illus.

Waste Treatment Processes—Group 5D

Identifiers: Activated, Biological, Cotton-D, Factories, Meat, Metal, Mills, Mixing, Packing, Sewage, Sludge, Treatment, Waste, Wool.

The maximal industrial waste/sewage ratio which can be handled in a complete mixing activated sludge system, without having a deleterious effect on the normal operation of the process is considered. The feasibility of industrial waste treatment without sewage additions using the same system is considered. Industrial wastes from effluents from meat-packing, cotton-mill, wool, and metal factories were used.—Copyright 1971, Biological Abstracts. Inc. Biological Abstracts, Inc.

AN INVESTIGATION INTO TERTIARY TREATMENT BY RAPID FILTRATION, Birmingham Univ. (England). Dept. of Civil En-

gineering. T. H. Y. Tebbutt.

Water Research, 5 (3): 81-92, 1971. Illus. Identifiers: Anthracite, Bacteria, Filtration, Rapid, Sand, Tertiary, Treatment.

The random nature of suspended solids (SS) con-The random nature of suspended solids (SS) con-centrations in the bacteria bed effluent from final settling tanks and from tertiary treatment units makes it almost impossible to comply with a stan-dard with 100% confidence. A more rational stan-dard would be produced by specifying a mean and SD, e.g. 10 + 3 mg l-1, or by assessing quality on a daily composite sample. For all the media ex-amined at a fixed depth of 600 mm, the filtration rate did not affect the removal of suspended rate did not affect the removal of suspended matter over the range 100-600 m3 m-2 d-1. Removal of SS from Minworth effluent ranged from 38-70% during the tests and it appears that the largest sand used (2.4-4.7 mm) was signifi-cantly less effective than the medium size sand (1.2-2.4 mm). Fine sand (0.5-1.0 mm) and a dualmedia bed offered no improvements in SS removal over a 1.0-2.5 mm anthracite bed. Anthracite over a 1.0-2.5 mm anthracite bed. Anthracite media did not appear to offer any benefits in SS removal compared with a similar grain size sand and on small-scale units it proved difficult to clean. Laboratory or pilot scale studied should be carried out for at least 12 mo. on any proposed tertiary treatment installation.--Copyright 1971, Biological Abstracts, Inc. W72-05721

CONTROL AND AUTOMATION IN WATER-

Polish Association of Sanitary Engineering and Technology, Warsaw. For primary bibliographic entry see Field 05F. W72-05729

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RESULTS OF INVESTIGATIONS ON PLANNING ONE- AND TWO-STEP FERMENTATION OF SEWAGE DEPOSITS,
Institute of Public Utility Service, Godansk (Po-

Jerzy Jezierski, and Aleksandra Morawska

Gaz Woda Tech Sanit. 44 (12): 400-404. 1970. Identifiers: Deposits, Fermentation, Planning, Poland, Sediment, Sewage.

A load of 5.2 kg/cu m/day of dry organic matter in the fermentation chambers is possible. Increasing the load did not result in a considerable decline in the degree of fermentation. The fermentation chambers (in Poland) under study had a double catamoers (in Poland) under study had a double system of mixing. Pumps for pumping sediment and the problems connected with the removal of sediment covering waters are discussed.—Copy-right 1971, Biological Abstracts, Inc.

MICROFAUNA OF ACTIVATED SLUDGE: PART I. ASSEMBLAGE OF MICROFAUNA IN LABORATORY MODELS OF ACTIVATED

Pol. Instytut Gospodarki Komunalnej, Pracownia

Hydrobiol., Warsaw (Poland). Henryk Klimowicz.

Acta Hydrobiol. 12 (4): 357-376. 1970. Identifiers: Activated, Assemblage, Ciliata, Fau-na, Laboratory, Micro, Models, Nematode, Rotifer, Sarcodina, Sludge.

Five separate experiments were carried out, dif-fering in the loadings of impurities contained in the sewage. A markedly greater difference could be observed in the number of individuals of a particular species than in the species assemblage. At high loadings the most numerous were Paramecium caudatum, Vorticella putrina, V. microstoma, V. extensa, Opercularia microdiscum and O. coarctata. At medium loadings Trachelophyllum pusi-lum; Cephalodella gibba, Amphileptus claparedei and Litonotus fasciola were observed. At low loadings V. picta, Zoothamnium arbuscula, Z. sim-plex, Coleps hirtus, Peranema trichophorum, Monostyla bulla and Actinosphaerium eichorni were noted. At varying loadings, a similar number of individuals was presented by Vorticella conval-laria. Arafides a certa Hobestoch bidess. No laria, Aspidisca costata, Habrotrocha bidens, Ne-matodes sp., L. crinitus and Urostyla weissei.— Copyright 1971, Biological Abstracts, Inc. W72-05732

THE USE OF TTC FOR MEASUREMENT OF ENZYMATIC ACTIVITY OF BACTERIA IN THE OXYGENOUS DECOMPOSITION OF OR-

GANIC SUBSTANCES, Polish Academy of Sciences, Gdansk. Inst. of Hydraulic Research.

For primary bibliographic entry see Field 05A. W72-05735

PAPER INDUSTRY WATER QUALITY PROTECTION TECHNOLOGY: STATUS AND

NEEDS, National Council of the Paper Industry for Air and Stream Improvement, Inc., New York. Isaiah Gellman, and Russell O. Blosser.

Journal Water Pollution Control Federation, 43 (7): 1546-1549, 1971.

Identifiers: Activated, Centrifugation, Filtration, Fish, Industry, Oxygen, Paper, Protection, Sedimentation, Shellfish, Sludge, Technology.

Procedures for removal and disposal of settleable rocedures to removal and disposal of setuciane solids involving gravity sedimentation and thickening, flotation, screening, vacuum filtration, centrifugation, pressing, landfill, and incineration are reviewed. Technology for removal of O2-demanding materials involves biological processes from activated sludge treatment through non-aerated storage-oxidation basins. Techniques for aerated storage-extuation basins. Techniques to avoiding adverse receiving water aesthetic effects involve removal of turbidity through physicochemical and biological means, prevention and destruction of taste- and odor-producing materials, and prevention of foaming through out the production of the fall design. More recently technology for removal of color from chemical pulping and bleaching has received extensive development and has found application. Interference with fish and shellfish resources is prevented by process materials loss control, external treatment, and outfall placement. control, external treatment, and outral piacement. The adequacy of such technology is reviewed from the standpoint of 5 factors related to the industry and wastewater treatment techniques.—Copyright 1971, Biological Abstracts, Inc. W72-05737

VIRUS RETENTION BY MEMBRANE FILTERS, University Coll., London (England).

Water Research, 5 (5): 183-185. 1971. Identifiers: Filters, Membrane, Poliovirus, Reten-tion, Rheovirus, Virus.

The retention of poliovirus type 1 by membrane filters of pore size 0.45 micrometer decreased with filters of pore size 0.45 micrometer decreased with increasing filtration rates for suspensions in phosphate buffered saline. Recovirus type 1 was completely retained at all the rates examined. The poliovirus results suggest that membrane filtration may be unsatisfactory as a method for concentrating virus from large volumes of water.—Copyright 1971, Biological Abstracts, Inc. W72-05739

COMPREHENSIVE WATER AND SEWER

PLAN, 1970-1990, For primary bibliographic entry see Field 06D. W72-05794

COMPREHENSIVE PLAN FOR WATER AND SANITARY SEWER SYSTEMS IN THE MIDDLE GEORGIA AREA.

Briley, Wild and Associates, Daytona Beach, Fla. For primary bibliographic entry see Field 06D. W72-05797

WATER/SEWER FUNCTION PLAN AND PROGRAM-PRELIMINARY.
Central Piedmont Regional Council of Local

Government, N.C.

Available from the National Technical Informa-tion Service as PB-201 426, \$3.00 in paper copy, 80.95 in microfiche. Central Piedmont Regional Council of Local Governments, Charlotte, North Carolina, Function Plan and Program Series Technical Report No. 1, January 1971. 203 p. 20 fig, 7 tab, 38 ref. HUD NCP-135.

Descriptors: \*Planning, \*Regional analysis, \*North Carolina, \*Water resources development, \*Water supply, \*Sewerage, Cities, Urbanization, Grants, Coordination, Long-term planning, Drainage systems, Water demand, Programs, Forecasting Forecasting. Identifiers: \*Comprehensive plan.

The water and sewer functional plan is the first component of the comprehensive regional plan of the 9-county Central Piedmont Region. Although primarily agricultural, the areas around Charlotte and Gastonia are undergoing rapid urbanization. The water and sewer plan will become a guide for carrying out the Council's role as a regional clearinghouse for review of applications for federal grants for water and sewer projects. It will also become the framework upon which orderly development patterns can be established for water, sanitary sewer, and storm sewer systems. An inventory is presented of existing water and sewer facilities. Based upon the inventory data, studies were made to determine which facilities are inadequate now, and when others are likely to become inadequate. Storm sewer systems have not been connected to, or combined with, sanitary sewer systems. Only the major urban areas have storm sewers now. The long range plan includes recommendations for storm sewer service in all urban areas. The Council is studying drainage in the region and will coordinate its studies and planning with those of other agencies including the U.S. Department of Agriculture. Specific recommendations are made for providing and improving water supply and sanitary sewerage. (Poertner) W72-05799

REPORT ON IMPROVEMENTS TO THE BOSTON MAIN DRAINAGE SYSTEM, VOL. I. Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 05G. W72-05800

REPORT ON IMPROVEMENTS TO THE BOSTON MAIN DRAINAGE SYSTEM, VOL. 2. Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 05G. W72-05801

LANCASTER'S NEW WATER-TREATMENT

PLANT, Huth Engineers Inc., Lancaster, Pa. For primary bibliographic entry see Field 05F. W72-05803

### **Group 5D—Waste Treatment Processes**

MAGNESHIM CARBONATE - A RECYCLED

COAGULANT, Florida Univ., Gainesville. Dept. of Environmen-

tal Engineering. For primary bibliographic entry see Field 05F. W72-05804

WATER QUALITY AND TREATMENT: PAST,

PRESENT AND FUTURE, Florida Univ., Gainesville. Dept. of Environmental Engineering.

J. E. Singley, and A. P. Black.

Journal of American Water Works Association, Vol 64, No 1, p 6-10 January 1972. 6 fig, 22 ref.

Descriptors: \*Water treatment, Automation, Sludge disposal, Magnesium carbonate. Identifiers: \*Process control, Polymers.

Water treatment history is reviewed and potential processes and control parameter refinements requiring further investigation and application are cited. Water treatment design traditionally has been conservative. Some utilities have adopted polymers for use as primary coagulants and coagulant aids, and automatic monitoring and process control. Some have instituted individual research programs. The time lag between process develop-ment and plant adaptation must be decreased. Research considerations include process optimization, development of new control methods and coagulants, place and extent of mixing, increased automation, development of new filtration media, the effect of trace minerals and organics, improving disinfection, and sludge disposal. The utility of recovering and recycling MgCO3 at purification facilities is discussed. A 50gpm pilot plant at Montgomery, Alabama is evaluating this recycled coagulant for effectiveness in reducing color and turbidity. (Nardozzi-AWWARF) W72-05806

DISPOSAL OF ALUM SLUDGES.

Clark, Dietz and Associates, Urbana, Ill. A. E. Albrecht.

Journal American Water Works Association, Vol. 64, No 1, p 46-52, January 1972. 3 fig, 3 tab, 14 ref.

\*Flotation. Sewage. Descriptors: disposal, Waste disposal, Waste water treatment.
Identifiers: \*Alum recovery, Vacuum filtration,
Disposal methods, Alum sludge, Softening waste.

Present disposal methods for purification and softening wastes are enumerated. Four alum sludge treatment procedures were investigated. Alum sludge character includes insolubility in natural pH water, settleability but not easily concentrated or dewatered, and ability to clog soil when disposed on land. Recycling of supernatant from the sedimentation filter washwater is suggested. Advantages, disadvantages, and concentration considerations are provided for alum sludge treatment by discharging to surface waters and sanitary sewers, thickening, sand bed drying, lagooning, filter pressing, vacuum filtration, centrifugation, and freeze-thaw processes. Laboratory investiga-tions were conducted on alum recovery, flotation and vacuum filtration, and the mixing of alum sludge with raw sewage. Acidified alum sludge was amenable to dewatering by flotation and vacuum filtration. Pilot-plant work is recommended on alum recovery and mixing of the purifi-cation waste with raw sewage. (Nardozzi-AW-WARF) W72-05807

AND FURROW LIQUID WASTE DISPOSAL IN A NORTHERN LATITUDE, National Center for Urban and Industrial Health.

Cincinnati, Ohio. Solid Wastes Program. T. W. Bendixen, R. D. Hill, W. A. Schwartz, and G. G. Robeck.

Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 94, No SA 1, p 147-157, February, 1968. 8 fig, 5 tab, 4 ref.

Descriptors: \*Groundwater, Sanitary engineering, \*Waste disposal, \*Infiltration, \*Lysimeter, \*Waste disposal, \*Infiltration, \*Lysimeter, \*Liquid wastes, \*Municipal wastes, \*Water reuse, Trickling filters. Identifiers: \*Pilot-plant lysimeter, Westby (Wis).

The operation and performance of a municipal ridge and furrow liquid waste disposal system in use since 1959 was monitored for a year and a half. One hundred and fifty thousand gallons a day of trickling filter effluent are disposed into the soil via four 1-acre basins. A heavy stand of grass left unharvested over the winter apparently contributes to successful operation. The changes in infiltration rates and quality of the infiltrate with season and under various loading and operating conditions are examined. Companion field and indoor lysimeter studies compared various design and operational factors that may influence infiltration protection of ground water. (Skogerboe-Colorado State) W72-05808

CONTROL DEVICES FOR ANIMAL FEEDLOT

Nebraska State Dept. of Health, Lincoln. Water Pollution Control Council.

T. O'Brien, and T. A. Filipi.
In: Proceedings of Animal Waste Management
Conference, Kansas City, Missouri, February
1969. p 18-19, 1 fig., 1 ref.

Descriptors: \*Farm wastes, \*Waste treatment, Confinement pens, Cattle, Aerobic treatment, Runoff, Farm lagoons, Irrigation, Waste disposal, Waste storage, \*Waste water treatment, \*Feed

Identifiers: Anaerobic lagoons, Detention ponds

The confinement feeding of livestock animals in large numbers has produced one of the most perplexing and complex problems ever faced by en-gineers, planners, and developers, not to mention the livestock feeder himself. The problem includes solid waste disposal, stream pollution, and air pol-lution. Basically, it involves the controlling of wastes from the animals in the confined feeding operations. Several types of control facilities are possible, detention ponds, anaerobic lagoons, aerobic lagoons, and oxidation ditches. A detention pond is intended to hold surface runoff from the feeding area and has the disadvantage of collecting large amounts of water which must be disposed of within a few days. Anaerobic lagoons work best when wastes are added at a constant rate which is difficult to maintain in a cattle feedlot. An aerobic system appears to be the most satisfactory with wastes scraped into hydraulically flushing gutters and emptied into variable aeration lagoons for treatment. (See also W71-02049) (Dorland-Iowa State) W72-05818

BIOLOGICAL METHODS OF SLUDGE DE-

Envirogenics Co., El Monte, Calif.

Available from the National Technical Information Service as PB-207 480, \$3.00 in paper copy, \$0.95 in microfiche. Final Report to Environmental Protection Agency - Water Quality Office, August 1971, 143 p, 14 fig, 44 tab, 61 ref, 2 append. EPA Program 17070 EVY08/71, Contract No. 14-12-427.

Descriptors: \*Sludge treatment, \*Enzymes, Filtration, Oxygen \*Dewatering, requirements, Amino acids, Sewage bacteria, \*1 treatment, \*Biological treatment, Microorganisms, Cultures, Sewage treatment. Identifiers: \*Sludge matrix, Vacuum filters.

Improved dewatering of sewage sludge has been accomplished for the first time by biological accomplished for the lifst time by biological means; namely, through the agency of the enzyme lysozyme acting under controlled conditions. Im-proved dewatering was measured by a 4 to 8-fold increase in filtration rate, which, if extrapolated to plant scale operations, should result, in a given time period, in a 2 to 3-fold increase in solids yield, thus achieving a significant cost saving. A number of other exo- and endo-enzymes were also tested for their effects on dewatering, with uncertain results. Several microorganisms were isolated that showed lysis around their colonies when they were grown on agar plates containing sludge. Attempts were made to enhance this lytic property through the isolation of ultraviolet resistant mutants that exhibited the phenomenon to an increased degree. Selection of matrix-solubilizing organisms was at-tempted by means of enrichment culture procedures that used an alkaline extract of sludge as the selective medium, which allows the removal of filter-clogging materials that would otherwise obscure the positive action of sludge modifying enzymes. Of major significance is the demonstration that the relative mild conditions of a biological process permit attacking the sludge dewatering process at its source - the (Mechalas - Envirogenics Co.) the matrix material.

### 5E. Ultimate Disposal of Wastes

EFFLUENT DISPOSING SYSTEM, For primary bibliographic entry see Field 05D. W72-05305

AERATION DEVICE FOR SEWAGE PLANTS WITH BIOLOGICAL PURIFICATION For primary bibliographic entry see Field 05D.

OCEAN DISPOSAL OF BARGE-DELIVERED LIQUID AND SOLID WASTES FROM U.S. COASTAL CITIES,

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Dillingham Corp., La Jolla, Calif. Applied Oceanography Div.

D. D. Smith, and R. P. Brown. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$1.25. U. S. Environmental Pro-

tection Agency, Solid Waste Management Office, Publication SW-19c, 1971, 119 p, 29 fig, 10 tab, 207 ref, 5 append. PH 86-68-203. Descriptors: \*Cities, \*Solid wastes, wastes, \*Sludge disposal, \*Water quality, Water pollution sources, Sludge, Marine plants, Legal aspects, Aquatic life, Monitoring, Regulation,

Legislation. Data processing, Research and development. Identifiers: \*Oceanic disposal practices, \*Marine environment, \*Marine waste disposal systems, Marine resources, Environmental research.

A field survey was made of twenty U.S. coastal cities to appraise the national status of oceanic disposal of solid wastes and industrial sludges from ships and barges. The objectives were: (1) to determine the nature and magnitude of present oceanic disposal practices from major U.S. coastal cities; (2) to evaluate what is known regarding the effects of these wastes on the marine environment, and particularly, the biota; (3) to summarize the legal framework under which these disposal operations are carried out; (4) to determine the status of regulatory monitoring of these operations; and (5) to identify those aspects of marine disposal which are problem areas and make ap-propriate recommendations. In order to conserve and utilize the environmental and other resources of the sea, it is recommended that: (1) the Federal government in conjunction with the coastal states evaluate existing conventions, treaties, laws, and regulations pertaining to marine waste disposal and adopt appropriate legislation and regulations to establish an effective legal framework; (2) the Federal government establish uniform application and review procedures for marine waste disposal permits and minimum standards for baseline surveys, monitoring procedures, and related data management and dissemination; (3) the Federal

### Water Treatment and Quality Alteration—Group 5F

government support and participate in environ-mental research leading to effective functional designs and operating criteria for beneficial or nondamaging disposal of wastes into the marine environment and to specifically probe those items known to cause environmental problems; (4) the Federal government support engineering research, development, and demonstration of marine waste disposal systems. (Davis-Chicago) W72-05555

HYDROGEOLOGY OF SOLID WASTE DISPOSAL SITES IN NORTHEASTERN IL-WASTE

Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 05B. W72-05564

POLLUTION OF GROUNDWATER DUE TO

MUNICIPAL DUMPS,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05B. W72-05651

DISPOSAL OF ALUM SLUDGES, Clark, Dietz and Associates, Urbana, Ill. For primary bibliographic entry see Field 05D. W72-05807

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RIDGE AND FURROW LIQUID WASTE DISPOSAL IN A NORTHERN LATITUDE, National Center for Urban and Industrial Health, Cincinnati, Ohio. Solid Wastes Program. For primary bibliographic entry see Field 05D.

CONTROL DEVICES FOR ANIMAL FEEDLOT

RUNOFF, Nebraska State Dept. of Health, Lincoln. Water Pollution Control Council. For primary bibliographic entry see Field 05D. W72-05818

### 5F. Water Treatment and **Quality Alteration**

PREDICTING QUALITY EFFECT OF PUMPED STORAGE.

Water Resources Engineers, Inc., Walnut Creek, Calif. C. W. Chen, and G. T. Orlob.

Paper, International Conference on Pumped Storage Development and Environmental Effects, Milwaukee, Wis, Sept 1971. 21p, 7fig, 2 tab, 13 ref.

Descriptors: \*Ecosystems, \*Ecology, \*Pumped storage, \*Water quality, \*Model studies, Zooplankton, Biota, Bacteria, Benthic fauna, Fish, Environmental effects, Reservoir storage, Nutrients, Temperature, Algae, Hydrologic data, Dissolved oxygen, Weather, Reservoir operation, Water temperature, Phytoplankton, Euthrophica-

Identifiers: Smith Mountain Project (Va), Weather

While much attention has been paid to the economic aspects of pumped storage, the environ-mental effects, particularly the water quality within the reservoir, have seldom been fully assessed. The pumped storage impoundment is invariably a complex ecosystem hosting a wide spectrum of biota--bacteria, phytoplankton, zooplankton, fish and benthic animals. Nutrients from runoff can be concentrated and retained in the ecosystem through algal assimilation and sedimentation. Accelerated euthrophication of the environment may result. A predictive technique has been developed for calculating the environmental changes and evaluating the alternatives of pumped storage operation that may enhance a normal cologic succession and forestall adverse environ-mental problems. The model, applied to Smith Mountain Reservoir, Va, reveals that improved water quality can be achieved by modifying the pumping-return schedule. (USBR) W72-05282 ecologic succession and forestall adverse environ-

SEWERAGE TREATMENT PLANT, Convert-All, Inc. (Assignee).
For primary bibliographic entry see Field 05D.

FATAL ARTERIOSCLEROTIC HEART DIS-EASE, WATER HARDNESS AT HOME, AND SOCIOECONOMIC CHARACTERISTICS, Johns Hopkins Univ., Hagerstown, Md. School of Hygiene and Public Health.

George W. Comstock George W. Comstock.
Amer J Epidemiol. 94 (1): 1-10. 1971. Illus.
Identifiers: Arterio, Disease, Economic, Fatal,
Hardness, Heart, Home, Human, Maryland,
Sclerotic, Socio.

Several reports have indicated an inverse correlation between the hardness of community water supplies and deaths from arteriosclerotic and degenerative heart disease. This association was studied in detail in Washington County, Maryland. Drinking water sources vary markedly in hardness, and a private census in 1963 made it possible to match cases and controls from the same defined population and to study a number of socioeconomic characteristics. During 3 yr, there were 189 deaths attributed to arteriosclerotic and degenerative heart disease among white males 45-64 yr who could be identified in the census. For each case, 2 controls were randomly selected from the census lists and matched for race, sex and year of birth. Water samples were collected from the residences of cases and controls and examined for total hardness. No significant association of ar-teriosclerotic and degenerative heart disease deaths could be found with water hardness. Deaths from these causes were more common among persons of lower socioeconomic status, among cigarette smokers, and among persons who attended church infrequently. Although water hardness is not likely to be a real risk factor for cardiovascular disease, the role of trace elements in home drinking water supplies should be investigated.--Copyright 1971, Biological Abstracts, W72-05407

TREATMENT OF SEWAGE AND EVALUATION IN AGRICULTURAL AREAS FROM A HY-GIENIC POINT OF VIEW, Ernst-Moritz-Arndt Univ., Greifswald (East Ger-

many). Hygiene-Institut. For primary bibliographic entry see Field 05D. W72-05410

CHARACTERISTICS OF E. COLI ISOLATED FROM DRINKING WATER AND THEIR SANI-TARY SIGNIFICANCE, For primary bibliographic entry see Field 05A. W72-05413

HYPERTENSION AND DRINKING WATER CONSTITUENTS IN COLORADO,

Oregon Univ., Portland. Medical School. William E. Morton.

Am J Pub Health. 61 (7): 1371-1378. 1971. Identifiers: Colorado, Constituents, Drinking, Fertilizer, Human, Hypertension, Nitrate.

Mortality and prevalence rates indicated that in 1960 there existed on Colorado's eastern plains a rural region in which the hypertension risk was sig-nificantly higher than in the rest of Colorado, urban or rural. This could not be ascribed to known variations in socioeconomic factors or availability of physicians. The pattern had not ex-isted in 1950. A 1960 statewide study of municipal water supplies showed that the hypertension pattern could not be explained by water hardness, but might be associated with nitrate concentration. Since the organic nitrates were associated with increased risk of diastolic hypertension in explosives workers, there is reason to suspect a causa-tive relationship between high nitrate levels in water and Colorado's emergent hypertension pattern. With continuing utilization of more and more intensive agricultural methods, particularly the use of water and nitrogenous fertilizers, nitrate concentrations in ground water can be expected to rise in many regions. Increased hypertension risk may be one of the ecological consequences of modern intensive agricultural procedures.—Copyright 1971, Biological Abstracts, Inc. W72-05414

ELECTRONIC WATER PURIFIER.

Ruffin Industries, Inc. (Assignee).

A. A. Gough.

U.S. Patent No. 3,498,457, 4 p, 11 fig, 6 ref; Patent Abstracts Section, Official Gazette, Vol. 872, No. 1, p. 166, March 3, 1970.

Descriptors: \*Patents, \*Water purification, \*Pota-ble water, Filtration, Sterilization, \*Water treat-ment, \*Filters. Identifiers: \*Drinking water.

A self-contained water purifying assembly is detailed to obtain potable and palatable water safe for human consumption. The water is passed through filtering devices for removal of solid impurities and irradiated in a germicidal unit. The fil-tering devices, the germicidal unit, a motor operated pump, and electrical power components are housed in a single case. (Sinha-OEIS)

INTEGRATED APPROACH TO PROBLEM OF

VIRUSES IN WATER, Federal Water Quality Administration, Concin-nati, Ohio. Advanced Waste Treatment Research Lab.

Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA 6, p 867-881, December 1971. 10 fig, 4 tab, 18

Descriptors: \*Viruses, \*Epidemiology, \*Viricides, \*Water quality, \*Filtration, \*Separation \*Water quality, \*Filtration, \*Separation techniques, \*Disinfection, Diseases, Water pollution effects, Sewage, Water treatment, Adsorption, Water purification, Public health, Water analysis, Rivers, Human diseases, Oxidation, Chlorination, Ion exchange, Electro-osmosis, Ozone, Ultraviolet radiation, Flocculation, Chlorine, Lime, Infection, Bacteria, E. coli. Identifiers: Polio virus, Reo virus, Echovirus, Iodine, Measles, Coxsackievirus, Enteroviruses, Adenoviruses, Ion exchange resins, Survival.

Since viruses in water are a potential source of in-fection and consequent disease in man, the need for improved methods of dealing with them is reviewed. Present methods for separating viruses from waters of various qualities are inadquate and need to be developed to separate small quantities of viruses from large quantities of water. Results obtained with several methods (ion exchange, cellulose nitrate membrane filter, ultrafiltration, electroosmosis) demonstrate the potential and shortcomings of presently available techniques. Review of processes for removing viruses during waste treatment and of disinfection of wastes shows that these methods also need to be improved. To cope with the present situation regarding viruses, research in the areas discussed (which viruses are important, methods of detection and identification, removal during treatment, and terminal disinfection) should be directed at an integrated approach. (Jefferis-Battelle) W72-05444

### Group 5F-Water Treatment and Quality Alteration

ULTRATHIN MEMBRANES FOR REVERSE OS-MOSIS WATER DESALINATION,

North Star Research and Development Inst., Minneapolis, Minn. For primary bibliographic entry see Field 03A.

W72-05450

MERCURY IN DRINKING-WATER SUPPLIES,

Environmental Protection Agency, Washington, D.C. Office of Water Data.
For primary bibliographic entry see Field 05A. W72-05491

IMPROVED RESINS FOR THE REMOVAL OF BORON FROM SALINE WATER--EXPLORATORY STUDY,

Dow Chemical Co., Walnut Creek, Calif. For primary bibliographic entry see Field 03A.

CONTROL AND AUTOMATION IN WATER-.WORKS.

Polish Association of Sanitary Engineering and Technology, Warsaw Henryk Janczewski.

Gaz Woda Tech Sanit. 44 (12): 390-393. 1970. Identifiers: Automation, Control, Water works.

Methods of planning control and automation in water-works are given. Most water-works now control such indices as pressure, flow and water level. Actual possibilities for control however, are much greater. Special attention should be given to water pressure, a problem already solved in many countries. Remote control of various equipment cannot be recognized as automation, nor can infor-mation disseminations by means of tele-equipment. On the basis of present experience such mechanical and chemical processes as rinsing fil-ters, determining Fe and Mn content, as well as content of certain other components can be made automatic. Broader application of automation will be possible only after water treatment and distribution are automatic .-- Copyright 1971, Biological Abstracts, Inc. W72-05729

VIRUS RETENTION BY MEMBRANE FILTERS, University Coll., London (England). For primary bibliographic entry see Field 05D.

COMPREHENSIVE WATER AND SEWER PLAN, 1970-1990. For primary bibliographic entry see Field 06D.

COMPREHENSIVE PLAN FOR WATER AND SANITARY SEWER SYSTEMS IN THE MIDDLE GEORGIA AREA.

Briley, Wild and Associates, Daytona Beach, Fla. For primary bibliographic entry see Field 06D W72-05797

WATER/SEWER FUNCTION PLAN AND PRO-GRAM--PRELIMINARY.

Central Piedmont Regional Council of Local Government, N.C. For primary bibliographic entry see Field 05D.

LANCASTER'S NEW WATER-TREATMENT

Huth Engineers Inc., Lancaster, Pa. C. E. Levis, and W. B. Smith. Journal American Water Works Association, Vol 64, No 1, p 25-28, January 1972.

Descriptors: \*Water treatment, Design criteria, Construction, Sludge disposal, Treatment facili-

Identifiers: \*River intake, High rate solids contact units, Thickener, Recycling, Sand beds.

Design and construction considerations are enu-Design and construction considerations are enumerated for a new water treatment plant with sludge handling facilities. A supplementary water source required further development. The existing plant treated 8mgd and included 2 clarifiers, 4 rapid sand filters, a 0.3 mgd backwash tank, 2 mgd clearwell, 3 high service pumps, and chemical feed equipment. A new river intake structure was designed to resist ice floe forces, self-scour at the extense. entrance to minimize sedimentation from the entrance to minimize secumentation from the river-bed load, have a manually cleaned screen, avoid trapping fish, and to have the pipe under the river manually cleaned. The pump selection data and clarifier specifications, including glass-fiber reinforced plastic internals for the high rate solids contact units, are given. An electronic automation system is used. Filter backwash water is settled in a holding tank with the supernatant pumped to the raw water line. Sludge from the clarifiers is concentrated in a gravity-type thickener. Sand beds were designed on the basis of laboratory studies to dewater the sludge. (Nardozzi-AWWARF) W72-05803

MAGNESIUM CARBONATE - A RECYCLED COAGULANT, Florida Univ., Gainesville. Dept. of Environmen-

tal Engineering.

C. G. Thompson, J. E. Singley, and A. P. Black. Journal American Water Works Association, 64, No 1, p 11-19, January 1972. 23 fig, 2 tab, 15 ref.

Descriptors: \*Magnesium carbonate, Sludge disposal, \*Color, \*Turbidity, \*Water treatment, \*Coagulation, Recycling. Identifiers: \*Modified technology, Jar test, Identifiers:

The development of a coagulant system that effectively reduced organic color and turbidity and eliminated major sludge disposal problems is described. A low-cost source of MgCO3 is under development. The major process reaction chemistry is described. The jar test parameters examined were coagulation pH, forms of alkalinity and hardness, settled water color and turbidity, elec-trophoretic mobility, residual magnesium, stabil-ized water character, and visual floc properties and settling rates. Type, grade, and preparation of materials are described. A filter photometer is utilized for measuring color and turbidity and a zeta meter for electrophoretic mobility. Jar testing procedures are outlined. Laboratory separation of carbonated sludge containing soluble MgCO3 and insoluble CaCO3 and clay is accomplished by filtration through Whatman No 40 paper. Linear regression analyses of MgCO3 dosage with color and turbidity were made. The heavy magnesium hydroxide floc increases present plant capacity. Recycled MgCO3 was as effective as new MgCO3. (Nardozzi-AWWARF) W72-05804 meter for electrophoretic mobility. Jar testing

FILTRATION OF FERRIC HYDROXIDE,

FMC Corp., Cartaret, N.J. G. A. Lewandowski, and H. B. Linford. Environmental Science and Technology, Vol 6, No 2, p 169-172, February 1972. 5 fig, 5 ref.

Descriptors: \*Filtration, Hydrogen ion concentra-Descriptors: "Furtation, "Variogen ion concentra-tion, "Water treatment, Iron compounds. Identifiers: "Filterability, "Ferric hydroxide, Base addition, Sample agitation, Surface charge, Streaming potential.

The influence of five process variables on the filtrability of ferric hydroxide precipitate was determined. These parameters included final pH, type of base used to precipitate the iron, rate of base didition, rate of sample agitation, and the iron concentration. Surface charge of the ferric hydroxide suspension was measured using a streaming potential technique. The surface charge

was correlated with filtration rates. The apparatus and filtering method are described. The streaming potential cell and apparatus, and the filtration equipment are illustrated. The rate of base addi-tion and sample agitation had negligible effect on the filtration time except when Ca (OH)2 was used as the precipitating base. Optimum pH range was 6.5-7.5 NaOH and KOH were the best precipitating bases. High iron concentrations improved fil-terability. (Nardozzi-AWWARF) W72-05805

### 5G. Water Quality Control

MIGRATIONS OF ADULT KING SALMON ON-CORHYNCHUS TSHAWYTSCHA IN THE SAN JOAQUIN DELTA AS DEMONSTRATED BY THE USE OF SONIC TAGS, For primary bibliographic entry see Field 07B. W72-05280

METHOD AND APPARATUS FOR SEPARAT-ING WATER AND OIL, Standard Oil Co. of Indiana, Chicago, Ill.

R. L. Yahnke.

U.S. Patent No., 3,487,927, 6 p, 5 fig, 2 tab, 8 ref; Official Gazette Vol 870 No 1, p. 137, January 6,

Descriptors: \*Patents, Separation techniques, Water pollution treatment, Water purification, Oily water, \*Oil wastes, Chemical wastes, Liquid wastes, Pollution abatement. Identifiers: \*Oil pollution abatement, Hydrocarbons, Liquid hydrocarbons.

Oil and oil-base compounds are separated from the surface of bodies of water and droplets of oil dispersed throughout a body of water are removed. The device is power-driven and has a continuous resilient plastic belt, a perforated cylinder, and a plurality of rollers for sequentially accepting water and oil, removing the water, removing the oil to form a regenerative volume of resilient porous material ready to receive additional amounts of water and oil. (Sinha-OEIS)

STREAM WATER AERATOR.

U. S. Patent No. 3,489,396, 5 p, 8 fig, 7 ref. Official Gazette Vol 870 No 2. p. 555, January 13, 1970.

Descriptors: \*Patents, \*Aeration, Water pollution treatment, Water purification, Dissolved oxygen, Water quality control, \*Stream improvement.

In an in-situ aeration system the waters are made to travel through a pipe-like device constructed like a venturi, so that the waters are made to flow through a slot at a speed sufficient to create a vacuum in the slot, and there suck in atmospheric air from air ejectors. The air is kept in contact with the water by the use of cantilever aprons located at the upper exit end of the venturi, thereby producing aeration. No external power sources are used. (Sinha-OEIS)
W72-05302

SKIMMER FOR SEPARATING FLOWING LIQUIDS FROM WATER, J. A. Ainlay.

U. S. Patent No. 3,623,609, 7 p, 7 fig, 5 ref. Official Gazette, Vol. 892, No. 5, p. 1717, November 30,

Descriptors: \*Patents, \*Oil wastes, Oily water, Separation techniques, Skimming, \*Water pollu-tion treatment, \*Pollution abatement, Hydrocarbons, Water pollution control, Liquid wastes. Identifiers: \*Oil skimmer, Oil spillage, \*Oil pollution abatement.

### Water Quality Control—Group 5G

Liquid floating on the surface of a water body is separated from the water and the separated water to the water body. A floating, seagoing skimmer has a separating chamber communicating at its lower end with the body of water into which it is placed. A weir at the foody of water into which it is forwardly extending curved surface which ter-minates in a skimming edge. A rotating vaned im-peller has a path of movement disposed relatively closely to the curved surface of the weir so as to carry the combined floating liquid and water over the weir and into the separating chamber. In par-ticular the invention relates to the separation of oil, gasoline, or other liquid hydrocarbons spilled in streams, lakes or other bodies of water. (Sinha-W72-05310

REMOVAL OF OIL FROM WATER, AMF Co., New York (Assignee). M. C. Sicard.

U.S. Patent No. 3,625,362, 7 p, 6 fig, 5 ref. Official Gazette, Vol. 893, No. 1, p. 141, December 7,

Descriptors: \*Patents, Oily water, \*Oil wastes, Pollution abatement, Water pollution treatment, Separation techniques, \*Filtration, \*Filters.

A combination filter/separator device and a system for its application will separate a mixture, suspension or emulsion of incompletely miscible fluids of different physical characteristics. It will deliver one component in a filtered condition and the others contain all the original particulate con-tamination. (Sinha-OEIS) W72-05314

#### OIL RECLAIM CURTAIN.

W. L. Kingsley. U.S. Patent No. 3,624,701, 6 p, 10 fig, 5 ref. Official Gazette, Vol. 892, No. 5, p. 1950, November

Descriptors: \*Patents, Oily water, \*Oil wastes, Separation techniques, Reclaimed water, Recla-mation, Leakage, Blowouts, Water pollution con-Identifiers: Offshore drilling, Oil leaks.

A curtain that may be rolled up or stored in sections can be readily transported and quickly in-stalled to enclose an area where oil has escaped into a water body. The reclamation device consists of a collapsible, continuous, generally annular, curtain floatably supported at the surface of a large body of water, and projecting above and below the surface. It retains within the area it surrounds oil surfacing from a leak or blowout occur-ring in a subsea oil well during or after drilling. (Sinha-OEIS)

W72-05317

OPTIMAL WATER QUALITY MANAGEMENT FOR THE HOUSTON SHIP CHANNEL, Tracor, Inc., Austin, Tex. Environmental Science

and Engineering Section.
Almond J. Hays, Jr., and Ernest F. Gloyna

Journal of the Sanitary Engineering Division, American Society of Civil Engineers. Vol. 98, No. 1, p 195-214, February, 1972. 12 fig, 4 tab, 13 ref.

Descriptors: \*Estuaries, \*Mathematical models, \*Systems analysis, \*Texas, Optimization, Water pollution control, Water quality control, Dissolved

A non-linear programming model was developed to determine least-cost solutions for improved dis-solved oxygen levels in the Houston Ship Channel. Results showed that non-linear programming can be successfully applied to estuarine quality problems. Steady state solutions were obtained in-dicating the wastewater treatment efficiencies required at each discharge site if the total cost was to be minimized. An important feature of the

Upper Houston Ship Channel was the high oxygen demand exerted by existing benthal deposits. Elimination of solids deposition was required if aerobic conditions were to be obtained. In an attempt to solve the problems of implementing least-cost solutions, an equitable tax and bounty system was formulated. (Ligon-Cornell) W72-05329

WATER POLLUTION CONTROL INSTITU-

Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst. William Whipple, Jr.

Engineering Issues-Journal of Professional Activities, American Society of Civil Engineers, Vol. 98, No. PPI, Proc. Paper 8667, Jan. 1972. p 13-23, 1 fig. 18 ref.

Descriptors: \*Jurisdiction, \*Water quality control, \*Institutions, \*Water pollution control, \*Regional analysis, Water management, Environmental engineering, Federal jurisdiction, Local governments, State jurisdiction.

At the Federal level, the protection of the environment appears to be a self-evident imperative, which one hardly would care to question. The only doubt appears to be whether or not existing water standards should be strengthened. However, at local level, industries and municipalities are reluctant to appropriate the very large sums of money required to meet the standards, particularly as it is often not clear what relationship each efas it is often not clear what relationship each er-fluent discharge has to the general condition of the stream. The Federal government appears to have abandoned the concept of regional water quality control systems, and to have suggested as a substitute metropolitan area waste handling systems, whereas in Great Britain, river basin authorities are making great progress. In the U.S. regional water quality planning has been de-emphasized. This approach leaves unsolved serious problems of interstate river basins, as regards surveillance, river quality analysis, and planning. W72-05326

FEASIBILITY OF THE METROPOLITAN WATER INTELLIGENCE SYSTEM. (IN-SYSTEM, (IN-OPERATIONAL TEGRATED AUTOMATIC CONTROL), American Society of Civil Engineers, New York.

For primary bibliographic entry see Field 04A. W72-05328

PRINCIPLES OF HYDROCHEMISTRY (OS-NOVY GIDROKHIMII), Institut.

Novocherkassk

Gidrokhimicheskii (USSR).

O. A. Alekin. Gidrometeoizdat, Leningrad, 1970, 444 p.

Descriptors: \*Water chemistry, \*Chemical analy-\*Water analysis, \*Water quality, \*Water sts, water aniaysts, water quanty, water types, Water utilization, Organic matter, Trace elements, Gases, Ions, Solutes, Precipitation (At-mospheric), Groundwater, Rivers, Lakes, Sea water, Water pollution sources, Wastes, Waste water treatment, Pollution abatement.
Identifiers: \*USSR, Natural waters, River waters,

Artesian substances, basins, Biogenous

This monograph consisting of 9 chapters is an expanded and substantially revised edition of two previous works by the author entitled General Hydrochemistry published in 1948 and Principles of Hydrochemistry published in 1953. Up-to-date data on the chemical composition and hydrochemical regime of groundwaters and waters of rivers, lakes, and seas are examined in terms of the practical importance of these data for establishing water-quality requirements for domestic, industrial, and agricultural water supply, and for protecting and enhancing water resources. Chemical processes in all natural

waters are viewed from the standpoint of their relationship to the environment, which influences the direction and intensity of these processes. The text has been approved by the USSR Ministry of Higher and Secondary Specialized Education for use as a handbook for students in hydrology, hydrogeology, and hydrobiology, and as a reference for researchers and engineers engaged in the study and utilization of natural waters. (Josefson-USGS) W72-05354

MAN AND HIS ENVIRONMENT, VOL. 2. LAW,

Earl Finbar Murphy. Harper and Row, New York, N.Y., London, England. 1971. 168 p. Identifiers: Book, Environment, Law, Man,

In response to one of the world's most pressing concerns, this series of brief, nontechnical books provide in-depth coverage of selected topics relat-ing to man and his environment. Unified in concept and integrated in approach, the books demonstrate that effective change results from an understanding of the total environment, rather than its independent elements. Treating each subject within the context of the human ecosystem, which includes not only the natural and the man-made but the physical and cultural conditions as well, ors pay particular attention to the economic use, management, and mismanagement of the environment and to the prospects for the foreseeable future, derived from the perspective of history and the knowledge of contemporary conditions and trends. This book in the series discusses the role of the law in the present environmental crises. Emphasis is on the fact that the attitude that law in any society assumes toward nature is determined by the kind of value each particular culture assigns to its environment. Discussed is the law and its environmental usage and the changing of man's traditions about nature. Included is a section detailing the legal means of controlling nature. A bibliography and subject index are included. (See also W72-05385)--Copyright 1971, Biological Abstracts, Inc. W72-05384

MAN AND HIS ENVIRONMENT, VOL. 3. WASTE, Wesley Marx

Harper and Row, New York, N.Y., London, En-

gland. 1971. 179p.
Identifiers: Air, Environment, His, Land, Man, Management, Waste.

This book in the series discusses the problem of waste considering the problem from the holistic point of view and including interconnections, in-teractions, consequences and the systems of man and nature together. Included are discussions of the planet as a 'dump,' with considerations of the earth's water, air, land and its inhabitants. Noted are the threats of waste to health, property, natural resources and survival; the 2 solutions available to man are presented and detailed: adaption or control. Also considered is man's imitation of nature's style of waste control including discussions of wastewater reclamation, wastes to shape the landscape by and materials reclamation. The last nanuscape by and materiais reciamation. The last sections discuss waste management and its possi-ble results. Suggested reading lists, and a subject index are included. (See also W72-05384)--Copy-right 1971, Biological Abstracts, Inc.

### FLOATING BOOM.

M. F. Smith

U. S. Patent No. 3,499, 290, 6 p, 19 fig, 9 ref; Patent Abstracts Section, Official Gazette, Vol 872, No 2, p 391, March 10, 1970.

Descriptors: \*Patents, Beach erosion, Oily water, \*Oil wastes, Pollution abatement, Separation techniques, Water pollution control, \*Floats,

### Group 5G-Water Quality Control

Sharks, Jellyfish, \*Barriers, Swimming, \*Flotsam, Shore protection, \*Erosion control.

Month protection, Ferosin Collady, Identifiers: Oil spillage, Oil pollution abatement, \*Floating booms, Shark exclusion devices, Jellyfish exclusion devices.

A portable flexible floating boom is used to confine oil and other floating material, and to protect beach areas from invasion by harmful marine animals. The boom has a series of elongated floats made of foamed elastomer connected in longitudinally spaced end-to-end relation by a continuous underwater barrier. The heavy-duty floating booms are capable of withstanding normal weather and wave conditions near a beach ex-posed to the open sea. They are deployed to minimize beach erosion or to enclose and protect swimming areas. (Sinha-OEIS) W72-05404

# STANDARDS OF QUALITY FOR CLASSIFICA-TION OF WATERS OF THE STATE. Rhode Island Dept. of Health, Providence. Div. of

Water Supply and Pollution Control.

Rhode Island Department of Health Report, 1970.

Descriptors: \*Water quality control, \*Rhode Island, \*Waste water treatment, \*Standards, Sewage, Industrial wastes, Fresh water, Sea water, Potable water, Sludge, Oil, Color, Turbidity, Coliforms, Taste, Odor, Hydrogen ion concentration, Water temperature, Radioactive wastes, Aesthetics, Classification, Water quality. Identifiers: Chemical pollution.

Water quality standards for classifying Rhode Island waters are presented. The standards fall into two major categories (fresh water and sea water) with four classes in each which define the uses of that water. The classifications consider all factors involved including public health, public enjoyment, propagation and protection of fish and wildlife, and economic and social development. Discharges from water treatment plants are not permitted to affect the water usage class that has been established. (Mortland-Battelle) W72-05419

### FLUID RECOVERY SYSTEM AND METHOD,

Campbell F. Logan.
U.S. Patent No. 3,500,841, 3 p, 2 fig, 4 ref; Patent Abstracts Section, Official Gazette, Vol. 872, No. 3, p. 799, March 17, 1970.

Descriptors: \*Patents, \*Liquid wastes, \*Leakage, Specific gravity, Waste disposal, Water pollution

In the case where a fluid leaks from a crack in a submerged flowline and the fluid has a specific gravity less than that of water and is immiscible with the water, the following system and method are provided. A chamber is placed over the crack. The chamber has an open bottom. An elongated conduit is attached to the chamber and draws the leaking fluid to the water surface. (Sinha-OEIS) W72-05434

## INJECTION WELLS POSE A POTENTIAL

THREAT, American Chemical Society, Washington, D.C.

Stanton S. Miller. Environmental Science and Technology, Vol 6, No 2, p 120-122, February 1972. 1 fig.

Descriptors: \*Injection, Industrial wastes, Legislation, \*Injection wells, \*Waste disposal wells, \*Well regulations, Texas, \*Liquid wastes. Identifiers: Treatability studies.

Technical and legislative criteria are presented for the disposal of liquid waste by deep-well injection. More than 200 industrial waste wells are in operation. No federal regulations bind these operations and few states have considered this problem individually. The adequacy of injection to solve fluid waste problems and the need for public, local, state, and federal controls are questioned. Subsurface areas can temporarily store reclamable fluids or permanently store unreclamable material. Injection theories are oversimplified or complex. Predictive mathematical equations are based on microscopic scale studies. EPA neither opposes nor promotes deep-well injection. Wastes un-treatable by alternate methods may be injected. Four states have specific injection laws. Texas requires treatability studies, a list of adjacent lan-downers, and a technical report to include geologic, waste, and well construction data. Specific effects of well injection operations are enumerated. A series of earthquakes in Denver during the 1960's were a function of well injection and time.
(Nardozzi-AWWARF) W72-05461

#### PLANKTON ENUMERATION AND EVALUA-TION.

Portland Water Bureau, Oreg. For primary bibliographic entry see Field 05B. W72-05492

# A SUMMARY OF MASSACHUSETTS STATE LAWS, POLICIES AND PROGRAMS PERTAIN-ING TO WATER AND RELATED LAND

Massachusetts Water Resources Commission, Boston. Div. of Water Resources. For primary bibliographic entry see Field 06E. W72-05515

#### PERMISSION TO FILE CONFERENCE RE-PORT ON H.R. 4148 UNTIL MIDNIGHT WED-NESDAY.

For primary bibliographic entry see Field 06E. W72-05516

# NORTH CAROLINA WATER PLAN PROGRESS REPORT, CHAPTER 1, WATER POLICY AND

LAW (DRAFT). North Carolina State Dept. of Water and Air Resources, Raleigh. For primary bibliographic entry see Field 06E. W72-05517

### WISE MANAGEMENT OF NORTH CAROLINA WATER RESOURCES THROUGH LAW--AN ORIENTATION BROCHURE--VOL. 1.

North Carolina State Dept. of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 06E. W72-05518

INTRODUCTION OF THE NATIONAL MARINE WATERS POLLUTION CONTROL AND QUALI-TY ENHANCEMENT ACT OF 1970, Congress, Washington, D.C.; and Senate, Washington, D.C.

For primary bibliographic entry see Field 06E. W72-05519

ENVIRONMENTAL QUALITY: THE SECOND ANNUAL REPORT OF THE COUNCIL ON EN-VIRONMENTAL QUALITY, AUGUST 1971. Council on Environmental Quality, Washington,

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 - Price \$2.00. 1971. 360 p, 27 fig, 45 tab, 13 append.

Descriptors: \*United States, \*Economics, \*Environmental effects, \*Water quality control, \*Evaluations, Federal government, Administrative agencies, Legal aspects, State governments, Administration, Judicial decisions, Legislation,

Costs. Benefits, Economic impact, Natural resources. Resource allocation, Adjudication procedure, Regulation, Administrative decisions, Pollution abatement, Water pollution control, En-

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This report describes the state of the environment and the efforts to improve it. It reviews many of the developments in the area of environmental quality which have occurred during the past year on the individual, local, state, federal, and international levels. It also describes both the status and trends in this area and discusses a number of environmental problems present in the inner city. A comprehensive examination of two fundamental aspects of environmental quality is included. The first of these aspects is economics: (1) the damages caused by pollution, (2) the costs and benefits of pollution control, (3) the particular impacts of costs on the economy, and (4) the strategies available both for attaining environmental goals and dealing with economic adjustments. The second aspect examined is the law and the environment, on both the federal and the state levels, including: (1) the National Environmental Policy Act of 1969 and its effects; (2) legal techniques in federal pollution control; (3) citizen checks on agency actions affecting the environment, such as the citizen's right to know about, participate in, and challenge such actions; and (4) specific developments in state law. (Johnson-Florida) W72-05520

## A BILL TO REGULATE THE DUMPING OF MATERIAL IN THE OCEANS, COASTAL AND OTHER WATERS AND FOR OTHER PUR-

Congress, Wash Washington, D.C. Washington, D.C.; and Senate, For primary bibliographic entry see Field 06E. W72-05521

OIL AND HAZARDOUS SUBSTANCE POLLU-TION CONTROL ACT OF 1968 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED).

For primary bibliographic entry see Field 06E. W72-05522

# IMPROVING THE QUALITY OF OUR EN-

VIRONMENT, Congress, Washington, D.C.; and House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-05524

#### WELL CONSTRUCTION REGULATION AND STANDARDS.

For primary bibliographic entry see Field 08A. W72-05525

ENVIRONMENTAL LAW: ECOLOGY HELD VALID CRITERION FOR DENYING DREDGE AND FILL PERMIT UNDER SECTION 10, RIVERS AND HARBORS ACT OF 1899

Duke Law Journal, Vol 1970, No 6, p 1239-47, December 1970. 53 ref.

Descriptors: \*United States, \*Permits, \*Rivers and Harbors Act, \*Navigation, \*Dredging, \*Administrative decisions, Federal government, Legal aspects, Water law, Administration, Administrative agencies, Judicial decisions, Legislation, Project planning, Land development, Environmental effects, Planning, Regulation.

In the case discussed by this article, landowners sought to reverse the decision of the Secretary of the Army refusing to grant a dredge and fill permit. The proposed dredge and fill operation would have had a potentially harmful effect on fish and wildlife in the bay area, but would not have interfered with navigation. The landowners contended that

the Secretary was not authorized to deny such permits for purposes not connected with navigation. The government argued that it was not required to issue a permit even though navigation was not hindereuction of navigation, and the statutory exception for sewage disposed in liquid form are examined. A critique of section 13 of the Act is included. Section three examines the philosophy be-hind the Act and its definition of pollution from industry's viewpoint. Changes in the regulatory framework of pollution control are discussed. Sec-tion four considers presently available methods of enforcement, including a discussion of: (1) the feasibility of using citizen qui tam actions and their drawbacks, (2) the Justice Department's prosecutorial policy under 1970 guidelines and a critique of their deficiencies, (3) the discretion to prosecute under section 17 of the Act, (4) the Corps of Engineers' permit authority and recent legislation to override institutional neglect of the Act, and (5) the Environmental Protection Agency's role in conjunction with the Corps. (Rees-Florida) W72-05529

INDUSTRIAL WATER POLLUTION AND THE REFUSE ACT: A SECOND CHANCE FOR WATER QUALITY,

Washington Univ., Seattle. School of Law. W. H. Rodgers, Jr.

Pennsylvania University Law Review, Vol 119, No 5, p 761-822, April 1971. 333 ref.

Descriptors: \*Water pollution control, \*Water quality control, \*Industrial wastes, \*Waste disposal, Environmental sanitation, Water pollution sources, Effluents, Sewage, Waste treatment, Monitoring, Industrial production, Industrial water, Water users, Waste indentification, Water properties, Navigable waters, Federal govern-ment, Permits, Waste water (Pollution), Legislation, Regulation, Obstruction to flow, Administrative agencies, Navigation. Identifiers: \*Refuse Act.

The recent revival of the Refuse Act provides an effective deterrent to industrial water pollution. Section one of this article outlines briefly the dimensions of the problem and the legal and scien-tific barriers to pollution control. Section two sum-marizes the Act's central features and explores judicial interpretation of important statutory language. The significance of the definition of refuse, the Corps of Engineers' concept of refuse in obstruction of navigation, and the statutory exception for sewage disposed in liquid form are examined. A critique of section 13 of the Act is included. Section three examines the philosophy behind the Act and its definition of pollution from industry's viewpoint. Changes in the regulatory framework of pollution control are discussed. Section four considers presently available methods of enforcement, including a discussion of: (1) the feasibility of using citizen qui tam actions and their drawbacks, (2) the Justice Department's prosecu-torial policy under 1970 guidelines and a critique of their deficiencies, (3) the discretion to prosecute under section 17 of the Act, (4) the Corps of En-gineers' permit authority and recent legislation to override institutional neglect of the Act, and (5) the Environmental Protection Agency's role in conjunction with the Corps. (Rees-Florida) W72-05530

### GUIDELINES FOR PLANNING AND REVIEW OF CHANNEL IMPROVEMENT.

Watersheds Memorandum - 108, United States Department of Agriculture, Soil Conservation Ser-vice, Washington, D.C., February 1971. 6 p.

Descriptors: \*United States, \*Project planning, \*Channel improvement, \*Drainage engineering, Federal government, State governments, Administration, Administrative agencies, Regulation, Water law, Planning, Economics, Environmental effects, Flood control, Flood protection, Stream stabilization, Environmental engineering, Watershed management, Reviews, Watersheds (Basins), Classification, Economic justification.

This memorandum provides guidelines for reviewing approved watershed work plans that include stream channel improvements not yet installed and for developing new watershed work plans involv ing channel improvement. The purpose of such review is to determine what changes in work plans or engineering design are needed to further na-tional policy and goals for the environment. Chan-nimum losses to fish and wildlife habitats. Channel improvement is supplementary to floodwater retardation, not an alternative for acheiving an adequate level of flood protection, and is not to tural production. The level of flood protection in agricultural flood plains should be only high enough to permit profitable use of such land within its capabilities. Improved channels should generally follow existing alignment. The least destructive construction techniques are to be used, even though they may increase costs. The reviews should be made by an interdisciplinary team and should classify the planned channel im-provement into groups as the basis for future im-plementation of the plans. (Johnson-Florida) W72-05531

# THE QUALITY OF OREGON'S WATER RESOURCES. Oregon State Univ., Corvallis. Water Resources

Available from the National Technical Information Service as PB-206 952, \$3.00 in paper copy, \$0.95 in microfiche. Publication WRRI-9, August 1971. 21 p. OWRR-A-999-ORE (11).

Descriptors: \*Oregon, \*Water quality, Water pollution sources, Pollution abatement, \*Water

The report describes the current pollution sources in Oregon and considers the effect of this pollution on receiving waters. It discusses the principal abatement methods being used, and reviews the progress being made in abatement programs in Oregon. The final pages briefly outline those problems which are expected to be most troublesome in the future. W72-05533

# OCEAN DISPOSAL OF BARGE-DELIVERED LIQUID AND SOLID WASTES FROM U.S. COASTAL CITIES,

La Jolla, Calif. Applied Dillingham Corp., Oceanography Div. For primary bibliographic entry see Field 05E. W72-05555

ENVIRONMENTAL POLLUTION, EXTERNALITIES, AND CONVENTIONAL ECONOMIC

MISDOM: A CRITIQUE, California Univ., Riverside. Dept. of Economics. For primary bibliographic entry see Field 06B.

# TOWARDS A RADICAL VIEW OF THE ECOLOGICAL CRISIS, Boston Coll., Chestnut Hill, Mass. For primary bibliographic entry see Field 06B.

W72-05568

THE COORDINATION OF LEGISLATIVE POL-ICY AND THE REGULATION OF PRIVATE IN-TERESTS: SOME SUGGESTED PRAGMATIC PRINCIPLES FOR ENVIRONMENTAL POL-

International Union for the Conservation of Nature and Natural Resources, Bonn (West Ger-

For primary bibliographic entry see Field 06E. W72-05569

WATER QUALITY IMPACT ANALYSIS. British Columbia Univ., Vancouver. H. C. Davis. The Annals of Regional Science, Vol 3, No 2, p 66-

74, 1969. 1 fig, 14 ref.

Descriptors: \*Water quality control, \*Analysis, \*Input-output analysis, \*Model studies, Estimation, Pollutants, Economics, Standards, Equa-

Identifiers: \*Impact analysis, \*Water quality multipliers, \*Interindustry analysis, Transactions ta-ble, Technical coefficient table, Table of direct and indirect requirements, Regional economy, Sectors.

The regional economy is viewed as a system of interdependent sectors in order to derive estimates of the total volume and mix of pollutants that will be discharged into receiving estuarine waters as a result of a stimulus to any particular regional sector. A set of water quality multipliers is derived from interindustry analysis. The multipliers can be used for impact analysis of sectoral economic change and also in the estimation of critical time periods before established water quality standards are surpassed. Input-output analysis is discussed in terms of the basic static version of the model, which is normally presented in the form of three tables: (1) the transactions table, (2) the technical coefficient table, and (3) the table of direct and indirect requirements. Input-output and water quali-ty analysis is discussed from the perspectives of: economic multiplier analysis, water quality mul-tiplier analysis, and critical time periods. Equa-tions are considered and developed. (Strachan-Chicago) W72-05575

### STEAM CLEANED WATER,

Office of the Chief of Engineers (Army), Washington, D.C. For primary bibliographic entry see Field 03D. W72-05576

INTERNATIONAL MANAGEMENT: ENVIRONMENTAL SOME PRELIMINARY

THOUGHTS, International Inst. for Environmental Affairs, Washington, D.C. For primary bibliographic entry see Field 06E. W72-05578

POPULATION CONTROL: ULTIMATE NECES-SITY IN WATER RESOURCE MANAGEMENT, Heller, Ehrman, White and McAuliffe, San Francisco. Calif. For primary bibliographic entry see Field 06B. W72-05580

WATER POLLUTION CONTROL IN FLORIDA. Florida Dept. of Air and Water Pollution Control, Tallahassee.

Descriptors: \*Water quality, \*Water pollution control, \*Standards, Water laws, Sewage, Industrial wastes, Municipal wastes, Farm wastes, \*Florida, Thermal pollution, Radioactive wastes, Sewage treatment, Water quality control, Legisla-

Water pollution problems of the state of Florida, the need for clean water, and regulations for maintaining water quality are described. Possible water pollution sources in the state are explored briefly and excerpts from Florida's Water Quality Standards are included. (Jefferis-Battelle)

LABORATORIES WHICH CONDUCT LEAD ANALYSES ON BIOLOGIC SPECIMENS, Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Occupational Health. For primary bibliographic entry see Field 05A.

### Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G-Water Quality Control

PROGRESS REPORT ON WATER POLLUTION CONTROL IN COLORADO. FISCAL YEAR

Colorado Dept. of Health, Denver. Water Pollu-tion Control Commission.

Progress Report, 1970-71. 17 p.

Descriptors: \*Water pollution control, \*Water quality, \*Standards, Colorado, Waste water treatment, Water quality control, Colorado River, Water pollution sources, Domestic wastes, Industrial wastes, Municipal wastes, Sampling, Monitoring, Legislation.

Identifiers: Arkansas River, South Platte River, San Juan River, Feedlots.

The Colorado Water Pollution Control Commission has authority for the prevention, abatement, and control of the pollution of the water of the state'. It is authorized to propose Water Quality Standards and to enforce compliance with these standards. The commission has set up programs for investigation, surveillance, and monitoring the water quality of Colorado streams and inspection of waste water treatment facilities. This report provides a general review of the activities during the 1970-71 fiscal year. (Mortland-Battelle) W72-05617

ENVIRONMENTAL PROTECTION

MINIMUM COST, New Jersey State Economic Policy Council. For primary bibliographic entry see Field 06C. W72-05661

TECHNOLOGICAL EXTERNALITIES AND RESOURCE ALLOCATION, Washington Univ., Seattle.

For primary bibliographic entry see Field 06A. W72-05662

RATE SURCHARGES: FRIEND OR FOE, Monsanto Enviro-Chem Systems, Inc., Chicago, Ill. Industrial Water Pollution Control Dept. C. T. Decker.

Water and Wastes Engineering, Vol 8, No 11, p F-2-F-4. November 1971.

Descriptors: \*Industrial wastes, \*Regulation, \*Cost allocation, Waste water treatment, Treatment facilities, Tax rate. Identifiers: \*Rate surcharges.

Tighter controls on both the effluent criteria and their enforcement will mean a greater capital investment by industry with a municipality. These controls will place more significance on the rate surcharge as a means for reimbursement of the operation and maintenance expenses. Also, they will serve as a limiting device on what industry will pay the municipality to treat and handle its wastes. Advantages to an industry of going to the city with untreated wastewater include (1) passing the treatment responsibility on to the city; (2) savings on construction costs; (3) passing the operation and maintenance problems on to the city; and (4) the possibility of enhancing its public image as a supporter for cleaning up the wastes. Possible disadvantages include (1) municipal treatment plants have traditionally been overdesigned and expensively overbuilt; (2) the distance between the company and the city may require many miles of sewers; and (3) the municipal sewerage commission may raise the rate surcharge at any time. The means of reimbursement for a sanitary district include (1) ad valorem taxes, (2) percentage of water bill tax, (3) special assessment charges, (4) volume of sewage charges, (5) 'ready to serve' charges, and (6) volume plus a rate surcharge for BOD, suspended solids, and other special constituents. (Settle-Wisconsin) W72-05663

ECONOMIC GROWTH AND ECOLOGY-AN ECONOMIST'S VIEW,
Minnesota Univ., Minneapolis. Dept. of

Economics. For primary bibliographic entry see Field 06C. W72-05665

BENEFITS OF WATER QUALITY ENHANCE-

Syracuse Univ., N.Y. Dept. of Civil Engineering.

Available from GPO, Sup of Doc as EP2.10:16110DAJ-12/70, and NTIS as PB-207 358, \$0.95 in microfiche. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series, December 1970. 201 p, 9 fig, 38 tab, 32 ref, append. EPA Program 16110 DAJ 12/70.

Descriptors: \*Water quality control, \*Pollution abatement, \*Tangible benefits, \*Economic efficiency, Measurement, Regions, Administrative agencies. Identifiers: \*Pollution index.

The three following areas pertaining to water quality and pollution control are considered: (1) the development of a pollution index for benefit analysis, (2) measurements of the total dollar benefit of water pollution control, and (3) benefits of water quality enhancement. A pollution index is developed for specific water uses when such mul-tiple items of water quality as BOD or DO are involved. The index is specific for one of three water uses, (1) human contact, (2) indirect contact, and (3) remote contact. These three specific indices may be combined into an overall pollution index. may be combined into an overall pollution index. The dollar benefit of a waterway at a given quality level is determined by listing all uses which both affect and are affected by water quality, by valuing each use individually, and by summing the resultant values. Measurable beneficial water uses include recreation, wastewater disposal, withdrawal water uses, bordering land uses, and in-stream uses. Finally, the study suggests that water pollution abatement programs can be administered most efficiently at the regional rather than state or federal level. Efficiency considerations also imply that the regional agencies should sell the pollution-carrying capacity of water based sell the pollution-carrying capacity of water based on benefits foregone due to pollution. (Settle-W72-05666

FACTORS AFFECTING POLLUTION REFERENDA,

Abt Associates, Inc., Cambridge, Mass.

Available from GPO, Sup of Doc in PC for \$2.50, from NTIS as PB-207 350, \$0.95 in microfiche. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series, July 1971. 331 p, 23 ref. EPA Program 16110 EXW 06/71. 14-12-902.

Descriptors: \*Water pollution, \*Pollution abatement, Taxes, Population, Municipal water, Regression analysis. Identifiers: \*Referenda, \*Bonds, User charges.

Defeat of a pollution control bond in a local community can result in a significant delay in the im-plementation of the Federal Water Pollution Con-trol Act. Hence, it is important that the Environmental Protection Agency understand what fac-tors affect the outcome of municipal bond elec-tions so that it can offer assistance wherever possible. Initial statistical investigation identified 34 independent variables associated with the outcome of bond elections in a non-random pattern. Regression analysis then identified eleven variables which together explain 62% of the variance in the outcome of bond elections for water pollution control. These eleven variables can be grouped into four categories: population characteristics, community characteristics, Characteristics of the bond issue, and campaign characteristics. The variables positively associated with passage of

bond issues are (1) proportion of population with family income less than \$3,000, (2) existence of a pollution problem, and (3) repayment by user charges. The variables negatively correlated with passage are (1) median income, (2) population growth, (3) municipal tax rates, (4) amount of the issue, (5) repayment by increased taxes, (6) existence of opposition groups, (7) partisappin of istence of opposition groups, (7) partisanship of groups in the campaign, and (8) the number of criticisms raised. (Settle-Wisconsin) W72-05669

THE ROLE OF LITIGATION IN ENVIRON-MENTAL POLICY: THE POWER PLANT SIT-ING PROBLEM,

Winer, Neuburger, and Sive, New York.

Natural Resources Journal, Vol. 11, No. 3, p 467-478, July 1971.

Descriptors: \*Legal aspects, \*Environment, Powerplants, Administration, Regulation, Institu-tional constraints, Environmental effects. Identifiers: \*Litigation, \*Environmental policy, \*Policy, Adversary proceedings, Power plant sit-ing problem, Judicial review, Public interest.

A most important aspect to environmentalists of any proposed resolution of environmental problems is the capacity to litigate the 'whether question', i.e. the alternatives considered include not carrying out the program. This type of adversary proceeding is an important environmental enforcement technique. Environmentalists regard the adversary process and the role of the courts so highly for two reasons. First, the adversary proceeding has been the most successful, narticularly proceeding has been the most successful, particu-larly in the early years when the environmentalist cause was wilderness oriented. Second, a method is provided which can arrive at a solution in cases when both reasonable and unreasonable minds may differ. However, there is widespread demand for reform of power plant siting proceedings, to simplify and shorten the processes. The one-stop process, a coordinated, systematic review by single regulatory agency, is suggested to avoid a horizontal profusion of administrative agencies and the vertical profusion of state, local and re-gional authorities. Most responsible environmen-talists would agree that there should be a one-step process with the following conditions: 1) it should be subject to adequate judicial review and 2) there is adequate private representation of the public en-vironmental interest. A second reform environmentalists seek is substantive. The basic criteria by which the build-or-not-to-build question is determined must be stated so as to avoid a presumption that what any applicant seeks to build should be built. (Davis-Chicago) W72-05690

THE BUREAUCRATIC RESPONSE TO EN-VIRONMENTAL POLITICS,

California Univ., Davis. For primary bibliographic entry see Field 06E. W72-05693

BARRIER FOR OIL SPILT ON WATER, British Petroleum Co. Ltd., London (England); and Low (Gordon) (Plastics) Ltd., London (En-

and Low (Gordon) (Flastics) Eds., London (England) (Assignees).

Denis Henry Desty, Leslie Bretherick, and Michael Guthrie Webb.
U.S. Patent No. 3,503,508, 3 p, 8 fig, 10 ref; Patent Abstracts Section, Official Gazette, Vol 872, No 5, p 1523, March 31, 1970.

Descriptors: \*Patents, \*Oil wastes, Pollution abatement, \*Skimming, \*Barriers, Separation techniques, Water pollution control. Identifiers: \*Oil skimmer, Oil spillage, Oil pollution abatement.

The floatable barrier consists of twin hoses longitudinally joined together and having a figure eight cross section. A flexible flap whose density is be the oil/w skim 0570

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### WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Water Quality Control—Group 5G

is between that of oil and water is connected below is between that of that water is connected below the skimming inlets. In use the flap finds the oil/water interface to encourage preferential skimming of the oil from the water. (See also W72-05709 and W72-05710) (Sinha-OEIS) W72-05708

BARRIER FOR OIL SPILT ON WATER, The British Petroleum Co., Ltd., London (Eneland) (Assignee).

gland) (Assignee). Denis Henry Desty, and Leslie Bretherick. U. S. Patent No. 3,503,512, 3 p, 8 fig, 8 ref; Patent Abstracts Section, Official Gazette, Vol 872, No 5, p 1524, March 31, 1970.

Descriptors: \*Patents, \*Oil wastes, Pollution abatement, Skimming, Barriers, Separation techniques, Water pollution control. Identifiers: \*Oil skimmers, Oil spillage, Oil pollu-

An inflatable barrier having water and air chambers which, when inflated, floats with part below and part above the water surface to impede the passage of floating oil. It may also have a skimming chamber which connects to the water level. (See also W72-05708 and W72-05710) (Sinha-OEIO). OFIS) W72-05709

BARRIER FOR OIL SPILT ON WATER,

British Petroleum Co. Ltd., London (England); and Low (Gordon) (Plastics) Ltd., London (England) (Assignees). Denis Henry Desty, Leslie Bretherick, and

Michael Guthrie Webs, Lesae Bietherick, and Michael Guthrie Webs. U. S. Patent No. 3,503,214, 3 p, 8 fig, 8 ref; Patent Abstracts Section, Official Gazette, Vol 872, No 5, p 1449, March 31, 1970.

Descriptors: \*Patents, \*Oil wastes, Pollution abatement, Skimming, Barriers, Separation techniques, Water pollution control. Identifiers: \*Oil skimmer, Oil spillage, Oil pollu-

The inflatable barrier consists of air hoses posi-tioned side by side to form a raft which has one or more water ballast chambers attached below. The barrier floats with part below and part above the water surface to impede the passage of floating oil. The air hoses are graded to form a wedge-shaped raft. (See also W72-05708 and W72-05709) (Sinha-OEIS) W72-05710

PAPER INDUSTRY WATER QUALITY PROTECTION TECHNOLOGY: STATUS AND NEEDS, National Council of the Paper Industry for Air and

Stream Improvement, Inc., New York. For primary bibliographic entry see Field 05D. W72-05737

POLLUTION CONTROL LOANS, Senate, Washington, D.C. For primary bibliographic entry see Field 06E. W72-05742

CONSERVATION, POLICY AND THE ROLE OF

COUNSEL, Maine Univ., Portland. School of Law. For primary bibliographic entry see Field 06E. W72-05743

NAVIGABLE WATERS SAFETY AND ENVIRONMENTAL QUALITY ACT OF 1971 (ABILL TO PROMOTE THE SAFETY AND PROTECT THE ENVIRONMENTAL QUALITY OF PORTS, WAT WATERFRONT AREAS, AND THE ABLE WATERS OF THE UNITED

For primary bibliographic entry see Field 06E. W72-05753

A BILL TO AMEND SECTION 8 OF THE FEDERAL WATER POLLUTION CONTROL ACT,

Washington, D.C.; and Senate, Washington, D.C. For primary bibliographic entry see Field 06E.

WATER QUALITY IMPROVEMENT ACT OF 1968 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED, RELATING TO THE CONSTRUCTION OF WASTE TREATMENT WORKS, AND TO COLUMN BURDOSES. FOR OTHER PURPOSES). For primary bibliographic entry see Field 06E. W72-05759

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO AUTHORIZE RESEARCH AND DEMONSTRATION PROGRAMS FOR THE CONTROL OF LAKE POLLUTION AND ACID AND OTHER MINE WATER DRAINAGE, AND TO PREVENT POLLUTION OF WATER BY ON LUTION OF WATER BY OIL.
For primary bibliographic entry see Field 06E.
W72-05760

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO AUTHORIZE RESEARCH AND DEMONSTRATION PROGRAMS FOR THE CONTROL OF LAKE POL-LUTION AND ACID AND OTHER MINE WATER DRAINAGE, AND TO PREVENT POL-LUTION BY OIL.

For primary bibliographic entry see Field 06E. W72-05761

POWERS OF LAKE AUTHORITIES. For primary bibliographic entry see Field 06E. W72-05774

LEAKY LEGISLATION: AN ANTIPOLLUTION PLAN CONTAINS A BIG LOOPHOLE FAVOR-ING OIL COMPANIES, Wall Street Journal, New York. For primary bibliographic entry see Field 06E. W72-05786

REPORT ON IMPROVEMENTS TO THE BOSTON MAIN DRAINAGE SYSTEM, VOL. I. Camp, Dresser and McKee, Boston, Mass.

City of Boston, Massachusetts, Public Works Department, September 1967. 194 p, 43 fig, 27 tab. P-Mass-3306 (HUD).

Descriptors: \*Drainage programs, \*Water pollution control, \*Flood control, \*Tunnels, \*Storm runoff, \*Underground storage, Harbors, Massachusetts, Water quality control, Waste water, Construction costs, Operating costs, Detention reservoirs, Storage, Planning, Drainage engineer-ing, Sewer systems, Surface runoff, Project planning.
Identifiers: \*Boston (Mass), \*Combined sewer

A study was conducted to determine the adequacy of and recommend improvements to principal in-tercepting sewers and conduits in the Boston main drainage system. Improvements as recommended to the Boston main interceptor and east side inter-ceptor along with the construction of a marginal conduit, pumping station and outfall sewer to eliminate overflows in South Boston. Because of the great importance of the intercepting sewers and conduits which require replacement, it has been considered necessary to investigate all reasonable alternative methods of handling mixed sewage and storm water overflows in order to recommend the most feasible long-range program which would also complement the most practica-ble initial construction program. Four possible methods were studied for abatement of pollution of the Boston Harbor and adjacent waters. This pollution is caused principally by overflows from the area's combined sewer systems. The four methods are: (1) complete separation of all sanita-ry sewerage and storm drainage systems, (2) con-struction of chlorination detention tanks, (3) construction of surface holding tanks, and (4) con-struction of the Deep Tunnel Plan. The Deep Tunnel Plan was shown to be the most economical of the four alternatives and is recommended for implementation. The construction cost of a regional Deep Tunnel Plan is estimated to be about 430 million dollars. This plan will involve the construction of large deep rock storage tunnels, shafts, transmission tunnels, surface connections, a main pumping station located on Deer Island and an in outfall and diffuser pipes. (See also W72-05801) (Poertner) W72-05800

REPORT ON IMPROVEMENTS TO THE BOSTON MAIN DRAINAGE SYSTEM, VOL. 2. Camp, Dresser and McKee, Boston, Mass.

City of Boston, Massachusetts, Public Works Department, September 1967. 182 p, 10 fig, 5 tab, 125 ref. P-Mass-3306 (HUD).

Descriptors: \*Drainage programs, \*Water pollu-tion control, \*Flood control, \*Flood control, \*Tunnels, \*Storm runoff, \*Underground storage, Harbors, Massachusetts, Water quality control, Waste water, Construction costs, Operating costs, Detention reservoirs, Storage, Planning, Drainage engineering, Sewer systems, Surface runoff, Project planning.
Identifiers: \*Boston, \*Combined sewer overflows,

Boston Harbor.

Background information is presented along with details concerning Boston's main drainage system. The purpose is to determine the adequacy of and recommend improvements to principal intercept-ing sewers and conduits in the Boston main drainage system. Improvements are recommended to the Boston Main Interceptor and East Side Interceptor along with the construction of a marginal conduit, pumping station, and outfall sewer to eliminate overflows in South Boston. Four possible methods were studied for abatement of pollution of the Boston Harbor and adjacent waters. This pollution is caused principally by overflows from the area's combined sewer systems. The Deep Tunnel Plan was shown to be the most economical of the four alternative plans considered and is recommended for implementation. This plan will involve the construction of large deep rock storage tunnels, shafts, transmission tunnels, surface connections, a main pumping station located on Deer Island and an ocean outfall and diffuser pipes. Appendixes cover: (A) history of the Boston Sewerage System Before 1950, (B) plan of existing sewerage system, (C) population trends for wards, (D) condition and capacity of ex-isting outlets, (E) public Boston connections to the metropolitan sewerage system, (F) the proposed deep tunnel plan, (G) subsurface data, and (H) bibliography. (See also W72-05800) (Poertner) W72-05801

STUDIES ON THE OPEN AIR BIOLOGY OF SALMONELLAE IN THE REGION OF THE WESER-LEINE RIVERS 1964-67, Niedersaechsiches Landesmuseum Hannover

(West Germany). For primary bibliographic entry see Field 05C. W72-05802

FRANCISCO BAY-DELTA WATER QUALITY CONTROL PROGRAM, California State Water Resources Control Board, Sacramento. San Francisco Bay-Delta Program.

Journal Water Pollution Control Federation, Vol. 40, No. 2, p 241-251, February, 1968.

### Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G-Water Quality Control

Descriptors: Water resources development, \*Water quality control, \*California, Waste water treatment, Waste water disposal, Project purposes, Competing uses, Water pollution control. Identifiers: \*Agricultural drainage, \*San Francisco Bay (Calif) San Joaquin polta (Calif). cisco Bay (Calif), San Joaquin Delta (Calif).

San Francisco Bay and the Sacramento-San Joaquin area comprise one of the most rapidly developing areas in the country. Existing and planned water project developments together with agricultural drainage waters have an effect on the area. A program, being conducted by the State of California and to be completed in 1969, will develop the basic features of a comprehensive plan for the control of water pollution including a system for the collection, reclamation, treatment, and disposal of waste and drainage water discharges. This project, perhaps the largest and most comprehensive ever undertaken, is unique in several aspects-area size, complexity of hydrological system, diversity of the beneficiaries, and methods of approach. (Skogerboe-Colorado State) W72-05809

### INDUSTRY AND THE ENVIRONMENT - FEEDLOT WASTE MANAGEMENT,

Texas State Legislature, Austin.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, February, 1969. p 5-7.

Descriptors: \*Farm wastes, \*Cattle, \*Regulation, Pollution abatement, Ecosystems, Waste disposal,

In assessing the significance of the various threats to our water and air resources, two items should be kept in mind: (1) no one can come to the environmental table with clean hands, and (2) a dis-proportionate emphasis placed on one segment of the problem may result in other areas going unnoticed. Animal waste in general and feedlot waste in particular pose significant environmental problems in the areas of (1) fish and other aquatic life and recreational uses, (2) potable water supplies and (3) land usage and esthetics. These environmental challenges can best be overcome by means of an effective and active alliance between the feeding industry and the responsible regulatory agency. (See also W71-02049) (Schmitt-Iowa W72-05811

### FEEDLOT POLLUTION SLIDE SHOW,

Federal Water Pollution Control Administration, Kansas City, Mo. Missouri Basin Region.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, February 1969. p 7-8.

Descriptors: \*Farm wastes, \*Runoff, \*Fish-kili, Irrigation, Farm lagoons, Odor, Cattle, \*Feed lots, Water pollution sources. Water pollution control, Iowa, Nebraska, Missouri River Basin. Identifiers: Flies

A major source of pollution in the Missouri Basin is agricultural waste from feedlots. There are over 46,000 feedlots in Iowa and over 24,000 in Nebraska. Over 4 million cattle were on feed last year in Iowa. The wastes generated by 100 cows are equivalent to 8 to 18 hundred people. Feedlot pollution too often occurs as a slug load washed into the stream after moderate or heavy rains. Twenty-eight slides show extreme examples of water pollution from feedlots. They include slides taken at the John Redmond Reservoir, where over a half million fish were killed from cattle runoff. Several slides of manure in feedlots depict conditions before and after heavy rains. Also shown is a feedlot with a diversion terrace, a large lagoon, a secondary lagoon, and cropland irrigation; thus the nutrient cycle is completed. (See also W71-02049) (Schmitt-Iowa State) W72-05812

ANIMAL WASTE POLLUTION - OVERVIEW OF THE PROBLEM,
Federal Water Pollution Control Administration.

Kansas City, Mo. Missouri Basin Region.

J. M. Rademacher
In: Proceedings of Animal Waste Management
Conferences, Kansas City. Missouri, February 1969. p 7-9, 4 ref.

Descriptors: \*Farm wastes, \*Groundwater, Cat-tle, Fish kill, Animal population, Runoff, Confine-ment pens, Waste treatment, Wells, \*Feed lots, Missouri River Basin, Water pollution sources. Identifiers: Population equivalents.

The volume of animal wastes produced in the United States is about ten times that produced by the human population Two billion tons of livestock wastes are produced annually in the U.S.A. This amount of waste production is equivalent to that of a human population of 1.9 billion. lion. There is evidence that animal wastes are a major source of water quality degradation. Feedlot runoff contaminates water supplies, destroys fish and aquatic life in streams, and generally degrades water quality. These wastes also have an effect on ground water, of 6000 water samples analyzed in Missouri, forty-two percent contained more than 5 parts per million nitrate as nitrogen. Public recognition and open discussions constitute a major step toward the solution to this major problem. (See also W71-02049) (Dorland-Iowa State) W72-05813

### INDUSTRY'S ROLE IN FEEDLOT POLLUTION

C. B. Joseph

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, February 1969. p 9-10.

Descriptors: \*Farm wastes, \*Cattle, \*Waste disposal, Runoff, Groundwater, Animal popula-tions, Kansas, Economics, \*Feed lots, Water pol-lution control, Water pollution sources, Industrial

Identifiers: Industrial expansion, Beef consump-

In Kansas cattle in feedlots with over 1000-head capacity have increased in excess of 700% and are producing over half the state's total beef production. In 1956, of the 182,000 head produce 30,000 head were produced in commercial feedlots with a capacity in excess of 1000 head; however, by 1969, the total production had risen to 766,000 head of which 486,000 were produced in feedlots with over 1000-head capacity. With this rapid increase in both the size and number of large feedlots, the problems of pollution control have become more pressing. Sites for new feedlots must be chosen more carefully with respect to terrain features and tax write-off incentives need to be extended to feedlot owners to cover the cost of adequate control and disposal facilities. (See also W71-02049) (Dorland-Iowa State) W72-05814

#### HOW TO CONDUCT A STATE INVENTORY. Minnesota Pollution Control Agency, Minneapolis.

J. P. Badalich

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, February 1969. p 11-12.

Descriptors: \*Farm wastes, \*Cattle, \*Investiga-tions, Runoff, Legislation, Minnesota, Waste disposal, Confinement pens, Financing, Permits, Topography, \*Feed lots. Identifiers: Inventory, Questionnaires.

The most important aspect of any feedlot inventory is the financing necessary to undertake such a project. Every government agency and private as-sociation is under a limited budget and the object of any study must be justified. Minnesota has 19,900 feedlots which makes personal investiga-

tions impractical and necessitate a canvas by mail. Some preliminary screening can be done by questionnaire which could be sent to households in rural areas. These questionnaires would not be applications for a permit, but would supply informa-tion on whether investigation for a permit would be necessary. These questionnaires would primarily determine the size of the operation, its location and topographical features, and the type of waste handling and disposal systems. Investigators could be sent where it was necessary and determine conformity to regulations and permits issued. (See also W71-02049) (Dorland-Iowa State) W72-05815

### HOW TO CONDUCT A STATE INVENTORY, Colorado Dept. of Health, Denver. Water Pollution Control Commission.

F. J. Rozich.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, February 1969. p 12-14.

Descriptors: \*Farm wastes, \*Cattle, \*Investiga-tions, Runoff, Legislation, Colorado, Waste disposal, Confinement pens, Financing, \*Feed

Identifiers: Inventory.

With the passage of the Colorado Water Quality Act of 1966, the Colorado State Agency gained ju-risdiction over wastes discharged by feedlots in The first task was gathering more specific information, such as ownership, acreage involved in the various feedlots, the number of animals fed, and the location of the facility. To animais fed, and the location of the facility. To carry out the inventory an engineering technician was employed for field surveys. The Milk, Food, and Drug Section and local health units were asked to complete a similar inventory as part of their rou-tine inspections of dairy cattle facilities. Where a possibility of water pollution was indicated, dis-trict engineers were asked to follow up and discuss the metre with the sweet of the facility. (See also this matter with the owner of the facility. (See also W71-01049) (Dorland-Iowa State) W72-05816

### THE KANSAS ANIMAL WASTE CONTROL PROGRAM,

Kansas State Dept. of Health, Topeka. Environ-mental Health Services.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, February 1969. p 15-17, 1 append.

Descriptors: \*Farm wastes, \*Legislation, \*Water quality control, Cattle, Investigations, Runoff, Kansas, Waste disposal, Permits, Fish kill, Odor, Retention, \*Feed lots, Water pollution control. Identifiers: Flies, Slug flow.

With the increasing size and number of cattle feedlots, the public has been aroused on the problems of odor and fly production. This concern was brought to the attention of the Kansas Department of Health where the concern shifted to water quality in 1959 when fish kills began occurring downstream from a few feedlots. Field investiga-tion of water pollution episodes revealed that the 'slug' flow of animal waste runoff can seriously pollute receiving streams. These investigations allowed the design of a control program which will yield significant results. These regulations require containment and control by irrigation practices of all runoff from animal feedlot installations, with the minimum retention of three inches of surface runoff. A copy of these regulations is included. (See also W71-02049) (Dorland-Iowa State) W72-05817

### CONTROL DEVICES FOR ANIMAL FEEDLOT RUNOFF, Nebraska State Dept. of Health, Lincoln. Water

Pollution Control Council.
For primary bibliographic entry see Field 05D.
W72-05818

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### WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

### Water Quality Control—Group 5G

RESEARCH ON ABATEMENT OF POLLUTION AND MANAGEMENT OF ORGANIC WASTES FROM CATTLE FEEDLOTS IN NORTHEAST-ERN COLORADO AND EASTERN NEBRASKA, Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 20-22, February 1969. 5 ref.

Descriptors: "Farm wastes, "Cattle, "Nitrates, Biochemical oxygen demand, Confinement pens, Runoff, Coliforms, Ammonia, Odor, Absorption, "Groundwater contamination, Water pollution sources, "Pollution abatement, "Organic wastes. Identifiers: "Feed lots.

Livestock in the United States produce over 1 billion cubic yards of wastes per year. About three fourths of our beef cattle are finished in feedlots. Some of these feedlots carry as many as 50,000 head, which presents a waste disposal problem similar to a city of 600,000 people. Rains are very efficient at picking up this material from feedlots, resulting in introduction of material with a high BOD into streams. Research was conducted to determine ground water pollution. Feedlots had the highest nitrate levels, but irrigated land probably contributes more total nitrate due to much larger acreage in irrigated land. There was a rapid die-off of the coliform population in feedlot soils, indicating little danger of ground water contamination by coliforms. Ammonia losses in the air result in odor and increased ammonia absorption by water surfaces around the feedlot. (See also W71-02049) (Dorland-Iowa State)

THE UNIVERSITIES' ROLE IN FEEDLOT POL-LUTION CONTROL, Iowa State Univ., Ames. Dept. of Agricultural En-

Iowa State Univ., Ames. Dept. of Agricultural Engineering. J. R. Miner.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 23-24, February 1969.

Descriptors: \*Farm wastes, \*Runoff, \*Universities, Confinement pens, Cattle, \*Pollution abatement, Research and development, \*Feed lots.

Until feedlot runoff control is achieved in a manner acceptable to the livestock producer, regulatory agencies and the general public, the univer-sities must play an active role. One of the principal contributions of universities toward solving the feedlot pollution problem is to guide and stimulate students through specific courses in livestock wastes combined with the basic principles of other scientific disciplines, such as civil and agricultural engineering, microbiology, chemistry, agronomy, and others. Extension education can be one effective method of alerting feedlot operators to the problems of feedlot runoff and bringing to them the currently available means of controlling or abating these problems. It also allows for feedback from feedlot operators to the university. A well-designed research project should, (1) be of interest or more researcher, (2) be compatible with available facilities. (3) stimulate growth on the part of the scientist and allow him to provide training to students, and (4) have some source of funding available. The roles of research centers and student training centers have been mutually benefi-cial. A university can interact with society through consultation of its staff with various individuals and agencies. Such interactions are possible because of the universities' reputation as an unbiased source of objective recommendations. (see also W71-02049) (Schmitt-Iowa State) W72-05820

HOW TO GAIN PUBLIC SUPPORT,

Kansas City Star, Mo. R. Turnbull.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 24-25, February, 1969.

Descriptors: \*Farm wastes, \*Runoff, Pollution abatement, Cattle, \*Feed lots.

On the pollution subject there are two extremes, one group would stop doing anything that might in any way pollute streams, such as use of commercial fertilizer; while the other extreme insists they will continue to do as they please. Between these extregnes are those people, both cattlemen and the general public, who will be reasonable if they are given the facts. The facts in the situation of feedlor tunoff pollution consist mainly of numbers. Although not so at one time, we now have so many cattle and other livestock in feedlots that we have a problem. We must realize the number of cattle on feed has doubled since 1950. These numbers as simply as anything define the problem, and are understandable to the public. When they do understand this, they will be better prepared to give public support for whatever is needed to solve the problem. (See also W71-02049) (Schmitt-Iowa State)

MINNESOTA FEEDLOT POLLUTION CONTROL PROGRAM -- STATUS REPORT,
Minnesota Pollution Control Agency, Min-

neapolis.
J. P. Badalich.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 25-26, February 1969.

Descriptors: \*Farm wastes, \*Legislation, Administrative agencies, Legal aspects, \*Regulation, \*Minnesota, \*Feed lots.

Following the Big Stone Lake study, a joint venture by the Governors of Minnesota and South Dakota, interest was generated in regulations regarding feedlot controls for the state as a whole. The Minnesota Pollution Control Agency is charged under statute for the control of all wastes. A 'preliminary draft' of regulations was published which caused criticism from many feeders and various organizations. These reports and comments should precipitate regulations that will be reasonable and desirable. We then go through the statutory procedure of public hearings, where we hope to get the reactions of the people in industry as well as the public at large. The next step is for the assistant attorney general to come up with the findings of fact, conclusions, and order. The Agency will then promulgate the standards, have them published, and issued. Following this we will set up specific rules, regulations and procedures, and then go into an inventory type procedure. Any regulation or standard proposed to the public or any industrial or municipal group must be reasonable, feasible, and practicable. (See also W71-02049) (Schmitt-Iowa State)

STATUS, PLANS, AND NEEDS FOR A COM-PREHENSIVE FEEDLOT POLLUTION CON-TROL PROGRAM IN SOUTH DAKOTA,

South Dakota State Dept. of Health, Pierre. Water Pollution Control Section.

B. Barker.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 26, February, 1969.

Descriptors: \*Farm wastes, \*Regulation, \*Administrative agencies, \*South Dakota, Legislation, Pollution abatement, \*Feed lots.

A provision for promulgation of regulations to control wastes associated with confined feeding of livestock was included in the Plan of Implementation of the 'Water Quality Standards for the Surface Waters of South Dakota.' The standards were adopted by the South Dakota Committee on Water Pollution on April 20, 1967 and by the Secretary of the U.S. Dept. of the Interior on August 7, 1967. In January, 1967, an Advisory Committee on the Committee on Water Pollution and the State Department of Health was formed to provide techni-

cal assistance in developing regulations. Proposed regulations were discussed at a public meeting in Pierre on December 9, 1968. The Committee on Water Pollution will review feedlot waste disposal information presented at the December meeting and will prepare a regulation for the purpose of holding public hearings. We are working with the South Dakota Water Resources Institute and Civil Engineering staff at South Dakota State University in developing a study on the effects of feedlot wastes on our surface waters. Plans include an education program to keep the industry informed of proposals and obtain feedback from the agricultural community. (See also W71-02049) (Schmitt-Iowa State)

STATUS REPORT OF MONTANA'S PROGRAM TO CONTROL POLLUTION FROM ANIMAL FEEDLOTS.

Montana State Dept. of Health, Helena. Water Pollution Control Section.

D. Willems

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 27, February, 1969.

Descriptors: \*Farm wastes, \*Regulations, \*Montana, Administrative agencies, Legislation, Pollution abatement, \*Feed lots.

Montana does not have feedlot regulations but at this time is developing regulations. Most complaints on feedlots are because of nuisance conditions, thus, control of both air pollution and water pollution seems essential. Development of a permit system for feedlots, similar to the present system for municipal and industrial waste discharges is hoped for. The main concern at this time is to have adequate control of new feedlots and the prediction is that there will be many in the state before too long. It looks as though much time could be spent on controls for existing feedlots with very little accomplishment. (See also W71-02049) (Schmitt-Iowa State)

MISSOURI'S ANIMAL WASTE MANAGE-MENT.

Missouri Water Pollution Board, Jefferson City. B. Crockett.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 27, February 1969.

Descriptors: \*Farm wastes, \*Regulation, \*Missouri, Administrative agencies, Waste disposal, Pollution abatement, Cattle.

The Missouri Water Pollution Board believes the agricultural pollution in Missouri can be controlled through a program of education at this time. The Board is cooperating with the University of Missouri Extension Service and the Federal and State Departments of Agriculture to educate the farming public for the control of agricultural pollution. In May, 1968, the University of Missouri Extension Service completed a revised agricultural inventory for the Board on the stream basins of Missouri. This study, to be updated every three years, includes land use data, fertilizer and pesticide usage data, as well as animal and poultry production data for each basin. The Missouri Water Pollution Board does not plan to request legislation pertaining to the registration of feeders and, and/or confiners at this time. (See also W71-02049) (Schmitt-Iowa State) W72-05825

STATUS REPORT - KANSAS FEEDLOT POL-LUTION CONTROL PROGRAM - EXTEM-PORANEOUS REMARKS,

Kansas State Dept. of Health, Topeka. Environmental Health Services.

### Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

### **Group 5G-Water Quality Control**

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 28, February, 1969.

Descriptors: \*Farm wastes, \*Regulation, \*Kansas, Administrative agencies, Fertilization, Cattle, \*Feed lots, Waste disposal.

As a result of research undertaken approximately five years ago at Kansas State University and the University of Kansas, it was concluded that the activated sludge type of treatment of wastes from animal feedlot operations is not feasible from an economic standpoint. Retention ponds and the use of retained wastes for agricultural purposes was the key to our solution in Kansas. Although final authority for pollution control rests with the Department of Health, our problems are approached with the livestock sanitary commissioner's office, the agricultural extension service, the county agent, the consulting engineer, and the feeder. We are not seriously concerned from the standpoint of ground water pollution by way of the feedlot surface or from retention facilities. We are more concerned with the solid waste material, the manures that are cleaned from the feedlot surface and reap-plied to agricultural land. The amount of nutrients that can be applied per acre is directly proportional to that which will be removed with the crop grown. We strive for cooperation and understanding from the animal feeding community, as this is essential to our program. (See also W71-02049) (Schmitt-W72-05826

STATUS REPORT - NEBRASKA FEEDLOT POLLUTION CONTROL PROGRAM,

Nebraska Water Pollution Control Council, Lincoln.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 29, February, 1969.

Descriptors: \*Farm wastes, \*Regulation, \*Nebraska, Fertilization, Administrative agencies, Runoff, Cattle, \*Feed lots.

Water Quality Standards have been adopted and are well-known to all persons in the state of Nebraska. Municipalities and industries have taken care of their responsibilities and other polluters must follow in the program. The problem of pollution from the industry of agriculture, specifi-cally feedlots, was brought to the attention of the Nebraska Water Pollution Control Council by persons living downstream from the feedlots. They brought in evidence such as samples of water and photographs which clearly convinced the Council that serious pollution does occur and corrective steps must be taken. A Feedlot Operators Committee was formed and assigned to prepare rules and regulations relating to the registration of feedlots. A voluntary survey regarding the size and location of feedlots received better than 80% compliance. The next assignment of the committee is development of solutions within the economic possibility of the industry. Research is carried on by the University of Nebraska Extension Division working with the United States Dept. of Agriculture. The greatest problem that confronts Nebraska Water Pollution Control Council is that of answering questions of persons intending to set up feedlot operations, since we have no guidelines for Nebraska conditions. (See also W71-02049) (Schmitt-Iowa State) W72-05827

STATUS OF NORTH DAKOTA'S PROGRAM TO CONTROL POLLUTION FROM ANIMAL FEEDLOTS.

North Dakota State Dept. of Health, Bismarck. Div. of Water Supply and Pollution Control.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 30, February, 1969. Descriptors: \*Farm wastes, \*Regulations, \*Administrative agencies, \*North Dakota, Runoff, Cattle, \*Feed lots.

Shortly after the state's new Water Pollution Control Board took office on July 1, 1967, they requested the State Department of Health to present to them as much information as possible on pollution from agricultural areas and, if possible, draft a proposed preliminary set of rules and regulations. The first draft was presented in October, 1967 and used Kansas proposed regulations as a guideline. An Advisory Committee on Feedlot Wastes was then established. It was composed of the Board, and representatives of the various catter raising and feedlot operators associations. This Committee was to review and comment on proposed regulations, discuss them with their constituents, obtain comments, and recommend changes. The Advisory Committee failed to obtain many comments on the third draft of the proposed rules and regulations and decided to withhold any further action until a report on the Animal Waste Management Conference in Kansas City on February 20, 1969 could be obtained. Due to the number of variable factors involved in feedlot operation, the actual extent of pollution is difficult to establish. Thus, there is a need for much additional research into the problem of feedlot pollution. Ultimately, rules and regulations will probably be adopted. (See also W71-02049) (Schmitt-Iowa State)

COLORADO'S STATEMENT, STATUS, PLANS, AND NEEDS FOR A COMPREHENSIVE FEEDLOT POLLUTION CONTROL PROGRAM, Colorado State Dept. of Public Health, Denver. Pollution Control Div. F. J. Rozich.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 30-31, February 1969.

Descriptors: \*Farm wastes, \*Regulations, \*Colorado, Cattle, Legislation, Administrative agencies, Runoff, \*Feed lots.

The extent of the problem of pollution attributable to feedlot wastes is being determined not only by the inventory being conducted, but also through stream studies. After public hearings and much discussion pro and con, the Colorado Water Pollution Control Commission adopted 'Rules for the Control of Water Pollution from Livestock Confinement Facilities' on April 10, 1968. Where it is determined, through field inventory and subsequent inspections, that a pollution problem does or can exist, the feeder will be asked to comply with the adopted rules. A Cease and Desist Order will be issued and an injunction sought if the feedlot operator fails to comply within a reasonable time. All types of animals corralled or tethered, including recreational horses, are included in the rules. The pace of advancement of a pollution control program is governed largely by the amount of monies and personnel available for such a project. (See also W71-02049) (Schmitt-Iowa State)

FEEDLOT POLLUTION CONTROL IN IOWA, Iowa State Dept. of Health, Des Moines. Environmental Engineering Service. R. J. Schliekelman.

R. J. Schliekelman.
In: Proceedings of Animal Waste Management
Conference, Kansas City, Missouri, p 31-32,
February, 1969.

Descriptors: \*Farm wastes, \*Regulation, \*Iowa, Cattle, Legislation, Administrative agencies, Runoff, \*Feed lots, Water pollution control.

A study committee comprised of three Iowa Water Pollution Control Commission members, two agricultural engineers and the extension veterinarian from Iowa State University was formariin November, 1966 to study the feedlot waste problem and make recommendations for corrective measures. During 1967 a permanent Agricultural Advisory Committee was appointed by the WATER Pollution Control Commission to formulate tentative criteria for a permit system and tentative standards for design of feedlot runoff control systems. Four public hearings were held in April, 1968 as a part of the procedure for establishing regulations. The 'Proposed Cattle Feedlot Waste Water Disposal Regulations' defined a feedlot and described conditions under which a permit for waste disposal is required. Accompanying tentative 'Requirements for Water Pollution Control Facilities' described satisfactory facilities for handling the feedlot runoff waste. The rules and regulations were adopted by the Commission in 1968 and referred to the Legislative Departmental Rules Review Committee for final approval. Objections were voiced and the rules were disapproved. The Committee did recommend and volunteered assistance in sponsoring legislation to permit a registration procedure. Demonstration grants have been requested from the FWPCA to build model facilities, which it is felt, would do more to prevent pollution from feedlots than any other item not already undertaken. (See also W71-02049) (Schmitt-Iowa State)

ANIMAL WASTE MANAGEMENT QUESTIONS AND ANSWERS,
Federal Water Pollution Control Administration,

Federal Water Pollution Control Administratio Kansas City, Mo. Missouri Basin Region. A. V. Resnik.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 33-34, February, 1969.

Descriptors: \*Farm wastes, \*Runoff, \*Confinement pens, Regulation, Water pollution control.

In the initial phase of confinement livestock feeding, feedlots were, by design, situated where the rains would scour the waste materials from the lots, preferably into nearby draws and streams. We know now that the highly concentrated organic waste cannot and must not be discharged without treatment into streams. The exact contribution and the total effect of animal wastes on the water quality of the Missouri River Basin is not known. Prevention and control cannot wait while all the data are collected and assembled. Feedlot runoff pollution could be greatly reduced with a minimum expenditure by utilizing known information. Regulations are necessary to insure the feedlot operator that the measure he is taking will guarantee a reasonable tenure of operation. Uniformity which concurrently allows for flexibility must be built into the regulations, since there is no one model or control device that will substantially alleviate animal waste pollution. Possible control methods include, (1) zoning of entire watersheds for livestock production, (2) government built 'first generation' plants of new concept and design, (3) development of supplemental range feeding programs, and (4) composting a mixture of manure and municipal garbage for use on a 'greenbelt' separating the city from the animals. (See also W71-02049) (Schmitt-Iowa State)

INVENTORY AND ASSESSMENT OF THE PROBLEM OF POLLUTION FROM FEEDLOT WASTES,

WASTES, North Dakota State Dept. of Health, Bismarck. Div. of Water Supply and Pollution Control. N. J. Peterson.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 34-35, February, 1969.

Descriptors: \*Farm wastes, \*Runoff, Confinement pens, Cattle, Pollution abatement, Regulations, \*Feed lots.

Feedlot wastes differ from municipal and industrial wastes in that they are not confined nor do they shoul potent basin state cere of feedle the property with the prop

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### WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

### Water Quality Control—Group 5G

have predictable flows. The wastes from feedlots generally reach the stream only during periods of runoff. The first step toward assessment of the pollution problem might be to determine areas of the state where most feedlots are concentrated and what major or minor river basins have the highest potential of being polluted at times of feedlot runoff. The next step might be to develop an inven-tory of feedlots including data on location, topog-raphy, number of cattle, and other characteristics of the lot operation and management. Methods of obtaining inventory information might be through permits, County Extension Offices, farm associa-tions, and perhaps through individual personal contact. A state water pollution control agency, adding pertinent weather data to this information, should be in a position to access the pollution potential, both individually and for each river basin. Certainly much can be accomplished if the state water pollution control agency makes a sincere offer of assistance and advice to individual feedlot operators. Rules should be drawn up for the purpose of assisting the state agency and the feedlot operator to solve a mutual problem. (See also W71-02049) (Schmitt-Iowa State) W72-05832

ASSESSING THE PROBLEM OF FEEDLOT POLLUTION, Missouri Univ., Columbia. Dept. of Agricultural

C. G. McNabb.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 35-36, February, 1969.

Descriptors: \*Farm wastes, \*Runoff, Confinement pens, Cattle, Pollution abatement, Legislation, \*Feed lots.

Cattle feedlots have been receiving an increasing amount of attention from pollution conscious peo ple because of their growing number and size, they can be seen and smelled, and our affluent society is becoming more concerned with esthetic values Action is demanded and we must progress using the best information available while trying to secure additional data. A partial list of useful data might include (1) quantity and capacity, (2) number of impoundments to catch runoff, (3) how the solids and liquids are handled, (4) the slope and length of slope, and (5) the soil type. Eventually the data should help us determine what effect feedlots have on the water quality of a basin. One method of developing an inventory is to legislate a permit requirement. A more desirable method is to voluntarily work with livestock organizations to gather information and set guidelines for pollution abatement. However, at the present time much uncertainty exists on the type of pollution abatement facilities that are effective and feasible. An information-education program is needed to create an awareness of the pollution problem by the livestock people. Awareness should precipitate more cooperation with agencies involved as well as initiate voluntary abatement programs. (See also W71-02049) (Schmitt-Iowa State) W72-05833

A RECOMMENDED PROCEDURE FOR DEVELOPING A MODEL FEEDLOT REGULA-TION, South Dakota School of Mines and Technology,

Rapid City. F. L. Matthew.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 37-38, February, 1969.

Descriptors: \*Farm wastes, \*Runoff, \*Regulation, Pollution abatement, Cattle, Legislation, Confinement pens, \*Feed lots, \*Model studies.

In the development of a feedlot regulation, other alternatives should first be considered and the need for a regulation firmly established. Next it is necessary to establish general and specific objec-

tives for the proposed regulation. After establishing objectives, restraints should be considered. Budget and staff limitations will normally be the most important restraints on the implementation program. The last step is to establish evaluation criteria which should include: (1) preventive or corrective nature, (2) clear information about the feedlot operators obligations, (3) enforceability within staff budget restraints, (4) provisions for appeal, (5) avoidance of discrimination, (6) control of both new and existing facilities, (7) control of construction and operation, (8) provisions covering ultimate disposal of wastes, (9) provisions for periodic updating, (10) compatibility with existing Federal, state and local laws, (11) definitions of pollution and pollution parameters, and (12) establishment of effluent quality standards and specification of sampling procedures. When these steps have been taken and necessary public infor-mation programs are underway, the development of the feedlot regulation and implementation program plans can proceed. (See also W71-02049) (Schmitt-Iowa State) W72-05834

RESEARCH NEEDS IN CATTLE FEEDLOT WASTE CONTROL, Kansas State Univ., Manhattan. Dept. of Civil En-

gineering. L. A. Schmid.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 38-39, February, 1969.

Descriptors: \*Farm wastes, \*Research and development, By-products, Pollution abatement, \*Feed lots.

Although research priorities cannot be neatly separated since most of the categories are interrelated, certain areas should receive increased research emphasis. Characterization of wastes should be included in studies wherever possible. The sanitary engineer's fundamental knowledge of biological waste treatment and other processes is sufficient that he can design a process, biological or otherwise, based on a knowledge of the waste characteristics. Biological treatment in a liquid system of the manure scraped from a feedlot system of the manure scraped from a feeding should not warrant a high degree of priority, since most of the biodegradable solids have already decomposed depending on the age of the manure and the conditions involved. Return to the land appears to be the most favored method of disposal. We know very little of the effect of the heavy loading anticipated from large feedlot operation, but somewhere there must be a balance between rate of waste disposal, land destruction, and crop production while satisfying the primary goal of pollution control of both surface and ground water. The next priority deals with either management practice or processes that reduce the solid or liquid waste that comes from the lot. Reuse of wastes as feed material and other by-product recovery schemes may require attention in the ture. (See also W71-02049) (Schmitt-Iowa State)

DEVELOPING AN ANIMAL WASTE MANAGE-MENT ACTION PROGRAM.

Missouri Univ., Columbia. Agricultural Extension

S. H. Bodenhamer.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 40, Februa-

Descriptors: \*Farm wastes, \*Regulation, \*Legislation, Pollution abatement, Water pollution control.

Many dynamic forces will affect the implementation of a desired animal waste management program. Before attempting to initiate change, any social system should (1) define the situation to be changed, (2) describe the desired situation, (3) list what needs to be done to accomplish the desired, and (4) describe the resources available and those

that are needed. A listing of the different au-diences or interest groups can be helpful in prepar-ing a message for them. Each audience will need to see how the change will help them satisfy their own needs for goods, services, and attitudes. Decide on what method is to be used to reach each audience, as change is best brought about through good communications and cooperation. Methods may be influenced by the size of the audience and ir state of adoption. Those to affect or be affected by animal waste management programs must be involved in deciding what should be the program. Cooperation is positively correlated with the degree of involvement the parties to be af-fected are involved in shaping the proposed action. (See also W71-02049) (Schmitt-Iowa State)

RESEARCH AND DEVELOPMENT VIEWS OF

ANIMAL WASTE MANAGEMENT, Federal Water Pollution Control Administration, Washington, D.C. Div. of Applied Science and Technology.

In: Proceedings of Animal Waste Management Conference, Kansas City, Missouri, p 40, Februa-

Descriptors: \*Farm wastes, \*Waste treatment, Cattle, Pollution abatement, Administrative agen-cies, Research and development, Water pollution

The problem of the waste from animal feeding must be considered not only as a pollution abate ment problem, but rather as an animal feeding or an animal management problem in which waste management is considered as an integral part of the overall problem of making a profit from your investment. The prime consideration is to max-imize profit taking into account the additional cost of waste management. This could even mean changing the feed to decrease the amount of wastes produced or the quality to make it easier to handle the waste products. The Office of Research and Development of the FWPCA is anxious to demonstrate new or improved techniques for handling the state of the country of the countr dling and treating animal wastes that reduce the pollutional load to receiving streams or ground water. Participation with industry can include up to 70% of the total cost. The nation as a whole desires pollution abatement to become an integral part of our economy and expects a definite im-provement in our environment. (See also W71-02049) (Schmitt-Iowa State) W72-05837

AN ANALYSIS OF THE ECONOMIC IMPLICA-TIONS OF THE PERMIT SYSTEM OF WATER ALLOCATION,
Iowa State Water Resources Research Inst.,

Ames. For primary bibliographic entry see Field 06B. W72-05839

WATER RESOURCES AND THEIR USE (VOD-NYYE RESURSY I IKH ISPOL ZOVANIYE).
Belorusskii Nauchno-Issledovatelskii Institut
Melioratsii i Vodnogo Khozyaistva, Minsk Belorusskii l Melioratsii i

For primary bibliographic entry see Field 06B. W72-05859

DRAINAGE DESIGN AS INFLUENCED BY CONDITIONS IN THE VICINITY OF THE DRAIN LINE

California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 08B.

CHLORIDE CONTROL - ARKANSAS AND RED RIVER BASINS, Army Engineer District, Tulsa, Okla. M. W. De Geer, and J. C. Ball.

### Field 05-WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G-Water Quality Control

Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol. 94, No. SAI, p 117-128, February, 1968, 6 fig, 2 tab.

Descriptors: \*Water quality, \*Water supply, \*Sanitary engineering, Chlorides, Control systems, Experimentation, Injection, Brines. Identifiers: \*Arkansas River Basin, \*Red River Basin.

Natural brine emissions are the principal cause of water quality degradation in the Arkansas and Red River Basins. Methods used to identify brine emission sources are discussed and the pollution problem is expressed in terms of daily flows of thousands of tons of salt past major cities in the basins. Alternative control solutions are discussed and some selected control plans are presented. The value of proposed control works is evaluated in terms of reduced chloride concentrations in major reservoirs. Also presented are proposals for experimental field work needed as a first step leading to final design of control works. (Skogerboe-Colorado State) W72-05876

### 06. WATER RESOURCES PLANNING

### 6A. Techniques of Planning

SUPERVISING RESERVOIRS AND CHOOSING THE MOST ECONOMIC SIZE FOR NEW HYDROELECTRIC INSTALLATIONS, Hydro-Quebec, Montreal. For primary bibliographic entry see Field 04A. W72-05320

A DECOMPOSITION APPROACH TO NON-LINEAR PROGRAMS AS APPLIED TO RESER-VOIR SYSTEMS.

State Univ. of New York, Stony Brook. Urban Science and Engineering Program. For primary bibliographic entry see Field 04A. W72-05321

OPTIMAL WATER QUALITY MANAGEMENT FOR THE HOUSTON SHIP CHANNEL, Tracor, Inc., Austin, Tex. Environmental Science and Engineering Section.

For primary bibliographic entry see Field 05G.

W72-05323

OPTIMIZATION OF A SINGLE EFFECT, MUL-TI-STAGE FLASH DISTILLATION DESALINA-TION SYSTEM, Western Electric Co., Inc., Princeton, N.J. En-

Western Electric Co., Inc., Princeton, N.J. Engineering Research Center. For primary bibliographic entry see Field 03A. W72-05324

SYNTHETIC SERIES PRODUCED BY MEANS OF PROBABILITY ANALYSIS AS APPLIED TO THE RIVER RHINE,

For primary bibliographic entry see Field 02E. W72-05330

A MATHEMATICAL MODEL OF WATER QUALITY IN AN IMPOUNDMENT, Washington State Water Research Center, Pull-

For primary bibliographic entry see Field 05B. W72-05454

NOTES ON SOCIETAL ACTION, California Univ., Los Angeles. Urban Planning Program. J. Friedmann.

Journal of the American Institute of Planners, Vol. 35, No. 5, September 1969, p 311-318, 2 tab, 30 ref.

Descriptors: \*Planning, \*Decision making, \*Model studies, Social aspects, Administration, Systems analysis, Aesthetics, Ethics, Management.

Identifiers: \*Societal action, Societal guidance system, Implementation.

The classical decision theory model is contrasted with an action-planning model in which planning and action are conceived as a single operation. Two types of societal action, system-maintaining and system-transforming, are identified together with their corresponding forms of planning. Criteria for evaluating societal guidance system performance are suggested, and improvement of the guidance system is presented as one of the most important missions for planning today. Personal characteristics that will permit the action-planner to use his technical competence effectively are enumerated: self-knowledge, high learning capacity, skill in the use of symbolic abstractions, empathy, ability to work in tense conflict-charged situations, knowledge of the dynamics and uses of power, and an ethics of responsibility. (Davis-Chicago)

WATER QUALITY IMPACT ANALYSIS, British Columbia Univ., Vancouver. For primary bibliographic entry see Field 05G. W72-05575

TECHNOLOGICAL EXTERNALITIES AND RESOURCE ALLOCATION,

Washington Univ., Seattle. L. D. Schall. Journal of Political Economy, Vol 79, No 5, p 983-1001, September-October 1971. 3 fig, 19 ref, apnend.

Descriptors: \*Resource allocation, \*Economic efficiency, \*Mathematical models, Competition, Monopoly, Optimization, Economics. Identifiers: \*Technological externalities, Pareto optimality.

The effects on resource allocation of technological externalities within a given industry are examined within the framework of a two-good, two-factor, static model. The technological externality enters in the form of an 'unpriced factor' such as air pol-lutants, fish in a communal lake, or unpatented innovations. This analysis differs from the standard theoretical approach in that it (1) abandons the assumption that competitive production is necessarily on society's production frontier, and thus (2) explicitly recognizes the difference between competitive and Pareto-optimal product transforma-tion schedules. These transformation schedules will differ, with the one exception occurring when all firms impose reciprocal externalities that are equal at the margin for all firms. Consequently, the standard generalizations regarding relative resource use may not hold. For example, air pollution may be greater under conditions of Pareto optimality than under conditions of competition. Furthermore, the traditional results in comparing the efficiency of monopoly and competition in an industry with technological externalities may be incorrect if the competitive and optimal transformation schedules differ. The orthodox approach is seen to be more misleading under conditions of external diseconomies than under conditions of ex-ternal economies. (Settle-Wisconsin)

A 'DISJOINTED INCREMENTALIST'S' AP-PROACH TO MEASURING RESEARCH BENEFITS AND COSTS, Minnesota Univ., St. Paul. Dept. of Agricultural

and Applied Economics. For primary bibliographic entry see Field 06B. W72-05672 MODELS IN URBAN PLANNING: A SYNOPTIC REVIEW OF RECENT LITERATURE,
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For primary bibliographic entry see Field 06B.
W72-05692

AN ANALYSIS OF THE ECONOMIC IMPLICA-TIONS OF THE PERMIT SYSTEM OF WATER ALLOCATION, Iowa State Water Resources Research Inst.,

Ames.
For primary bibliographic entry see Field 06B.
W72-05839

### **6B. Evaluation Process**

PREDICTING QUALITY EFFECT OF PUMPED STORAGE.

STORAGE, Water Resources Engineers, Inc., Walnut Creek, Calif.

For primary bibliographic entry see Field 05F. W72-05282

INFLATION, OBSOLESCENCE AND ENVIRON-MENTAL FACTORS, Los Angeles Dept. of Water and Power, Calif.

W. A. Sells. Underground Engineering, Vol 2, No 5, p 71-72, 94, Aug-Sept 1971.

Descriptors: Interest (Finance), Cost trends, Cost comparisons, \*Costs, Labor costs, Productivity, \*Obsolecence, \*Inflation (Economic), Obsolete equipment, Electric powerplants, Transmission lines, Transmission towers, \*Environmental effects.

Identifiers: \*Engineering economics, Underground transmission lines.

Engineering economics of utility service are affected by inflation, obsolescence, and environmental factors. The cost of supplying electric power to customers can be held within reasonable limits if the effects of these factors are understood and considered when planning utility projects. The cost of money is governed by supply and demand: the policies of the Federal Reserve Board govern the supply; general business activity provides the demand. Although interest rates vary with monetary policy and business activity, wage rates continue to escalate while labor productivity declines. Costs of material and equipment have not increased in proportion to wages. If the rate of inflation is greater than the interest cost on money, then it is more economical to build future needed installations now. Generating plants are planned for decreasing plant factors as new and more efficient sources of generation become available. Early obsolescence is not a problem in this country because of generation capacity shortages. Some environmentalists' proposals could make electrical service a luxury. Customers are unwilling to spend money for environmental improvements unless substantial benefits are realized. Costs of environmental considerations for several projects are given. (USBR)

THE FUTURE OF THE BUREAU OF RECLA-MATION IN HYDRO-POWER DEVELOPMENT, Bureau of Reclamation, Washington, D.C.

E. L. Armstrong. Water Power, Vol 23, No 9, p 314-324, Sept 1971. 4 fig, 8 photo.

Descriptors: \*Planning, \*Resource development, \*Hydroelectric power, Hydroelectric resources, Environmental effects, History, Construction, Project planning, Recreation facilities, Hydroelectric powerplants, Interconnected systems, Training, Peak power, Transmission (Electrical), Pumped storage, Power pooling. Identifiers: Powerplant systems, \*Bureau of Reclamation, Power pooling.

A concise history of the Bureau of Reclamation's involvement in hydroelectric power development in the Western United States is reviewed. A summary of 65 yrs of accomplishments in water and land resource development in the 17 arid and semiarid Western States, a description of current construction activity, a commentary on the changconstruction activity, a commentary on the chang-ing role of hydropower in the USA, and a look at potential Reclamation developments are presented. Continuing laboratory research in elec-tric power technology is expected to contribute immeasurably to future hydropower development by increasing efficiency, improving performance and safety, and lowering costs of operation and maintenance. The power operator training center, recently placed in operation at the Engineering and Research Center, Denver, is one of the most complete and realistic operator training centers in the world. Future developments will entail consideration of technological and economic factors, with greater emphasis on environmental effects. (USBR) W72-05285

BENEFIT-COST ANALYSIS FOR WATER SYSTEM PLANNING, American Geophysical Union, Washington, D.C.

American Geophysical Union, Washington, D.C. Charles W. Howe.

Available for \$2.00 from AGU, 1707 L St., N.W., Washington, D.C. 20036. AGU Water Resources Monograph 2, 1971, 144 p, 11 fig, 23 tab, 58 ref. OWRR C-2129 (No. 3367 (2).

Descriptors: \*Planning, \*Economic efficiency, \*Decision making, \*Estimated benefits, \*Estimated costs, \*Cost-benefit analysis.

The use of benefit-cost analysis for planning water resource systems is described in the context of various accounting stances. Examples of types of benefits and costs associated with various projects are presented to illustrate similarities and difstances. Techniques for handling non-quantifiable factors and for dealing with risks and uncertainties in planning are discussed. Several empirical stu-dies are briefly presented to illustrate many of the concepts and problems involved in benefit-cost W72-05327

NOTES ON SOCIETAL ACTION, California Univ., Los Angeles. Urban Planning For primary bibliographic entry see Field 06A. W72-05556

THE ECONOMIST AND THE 'NEW' CONSER-VATION, British Columbia Univ., Vancouver. Dept. of

Economics.

A. Scott.
In: Planning 1968 - Selected Papers from the American Society of Planning Officials National Planning Conference, San Francisco, May 1968. p 277-291. 24 ref.

Descriptors: \*Economics, \*Conservation, \*Resources, \*Social aspects, Management, Planning, Decision making, Land, Water, Analysis, Measurement, Land development.

\*Common property resources, Commercial interest, Conservation demands, Comparison, Resource expenditure.

The relationship between the economist and the 'old' conservation is discussed. The economist demonstrated that the old conservationists were advocating aims inconsistent with other social aims that they also favored. The economist also showed that there was room to investigate two possible important reasons for the market's mishandling of the conservation assignment: the conservation of common property resources and the possibility of a different social interest in the future. The new conservation deals with the

heterogenous land and water resources that may be in commercial hands but that are capable of producing other services only if they are organized collectively. Since the economist advocating the new conservation cannot use his old analytical new conservation cannot use his old analytical tools, he is faced with three new tasks: (1) discovering the abstract or theoretical categories within which conservation demands are to be found, (2) measuring the strength of these demands, and (3) comparing the strength of the demands for land for development purposes with the strength of the conservation demand. (Strachan-Chicaeo) Chicago) W72-05559

SYSTEMS AND PLANNING THEORY,

Rutgers - The State Univ., New Brunswick, N. J. Dept. of Urban Planning and Policy Development. J. Hughes, and L. Mann. Journal of the American Institute of Planners, Vol 35, No 5, p 330-333, September 1969. 25 ref.

Descriptors: \*Planning, \*Decision makin \*Systems analysis, Formulation, Model studies. \*Decision making, 'Applies analysis, Formation, Mouer studies, identifiers: "Planning theory, "Systems theory, "Policy making, "Literature, General systems theory, Models, Optimal policy formulation procedure, Definition, Interaction, Quantification.

Literature that has contributed to the convergence of systems theory with planning theory is reviewed. The literature is discussed in terms of the concept of system and systems theory and analysis. One of the early proponents of the organ-ismic conception was Ludwig von Bertalanffy. In his language, a system is a complex of interacting elements, and wholeness is a system attribute making the system behave as a whole. Recent developments involve application and diffusion of general systems theory into public policy and so-cial science. This development allows for the definition of the cultural, social, political, and spa-tial phenomena in the environment of planning quantified, understandable systems. Further more, this development can aid understanding of the process of public policy formulation and pro-vide the basis or model of an optimal policy formulation procedure. The definitions of 'system' represented by Buckley and Churchman are reviewed in this context. Dror considers urban planning as a subsystem of policy making or a specific form of policy making types. He creates an optimal model consisting of three stages which are closely held together by communication and are closely near together by communication and feedback channels: (1) meta-policy making, (2) policy making, and (3) post policy making. The concept of 'system' has, as predicted by Bertalanffy, 'become a fulcrum in modern scientific thought'. The tendency to study systems as a whole rather than as a conglomeration of parts is consistent with the tendency in contemporary science to no longer isolate phenomena in narrowly defined contexts. (Strachan-Chicago) W72-05560

ENVIRONMENTAL POLICY AND INTERNA-TIONAL INSTITUTIONAL ARRANGEMENTS: A PROPOSAL FOR REGIONAL AND GLOBAL ENVIRONMENTAL PROTECTION AGENCIES, New Mexico Univ., Albuquerque, School of Law. Albert E. Utton. Natural Resources Journal, Vol 11, No 3, July 1971, p 513-517. 12 ref.

Descriptors: \*Environment, \*Institutions, \*Institutional constraints, Decision making, Resource development, Resource allocation, Standards, Ad-

ministration.
Identifiers: \*Environmental policy, \*Environmental protection agencies, \*International institutions, Policy, Regional agencies.

Present international arrangements for protecting the environment are inadequate. The major defect with international environmental efforts is that of divided authority. Given the difficulties and uncertainties faced by policy makers in establishing machinery for the protection of the environment. nonetheless, the broad outlines of what is needed are beginning to emerge. (1) The environmental protection agency should be environmental and not developmental in orientation. Those agencies, national or international, which have had as their tradition the development and exploitation of resources are not by professional conditioning the best ones to supervise and control these same developmental activities in order to protect the environment. (2) It needs to set limits of what is permissible and what is not permissible. (3) It needs to enforce those limits as a policeman for the environment, or, if its authority is only persuasive, it needs to serve as a conscience for the environment. Rather than putting all our environmental eggs into one administrative basket, perhaps we should simultaneously pursue two distinct paths, one leading to a variety of regional agencies, and the other leading to international global agencies. Those international media, such as the strato-sphere and high seas, and perhaps the Arctic and sphere and night seas, and perhaps the Arctic and Antarctic, would be more amenable to an interna-tional global approach, since the standards would not be imposed within existing international boun-daries in most cases. Regional agencies could be established which would have comprehensive authority over environmental supervision within defined regions (North Sea countries, Mediterranean countries, North America, etc.). (Davis-Chicago) W72-05561

RESOURCES AND THE ECONOMIC FRAMEWORK,

P. A. Stone. Urban Studies, Vol 6, No 3, p 309-334, November 1969. 2 fig, 26 ref.

escriptors: \*Resources, \*Economics, \*Planning, \*Decision making, \*Financing, Environment, Values, Marketing, Measurement, Urbanization, Population, Standards, Administration, Political

aspects.
Identifiers: \*Economic framework, \*Development programs, \*Economic tests, \*Availability, Consumer, Built environment, Quasi-marketing

The availability of resources, both real and financial, is an important restraint on the developing pattern of urbanization. Development programs need to satisfy three economic tests: (1) Does the development provide good value for money. (2) Are the resources required to carry out the development programs available, or can they be made available by the time they are required. (3) Is the finance available to ensure that the resources are moved in the required directions, and are people ready to transfer the money into the sectors of the economy appropriate to the achievement of the development programs. These three economic tests should be applied nationally, regionally, and locally to all development programs. The tests reveal all the difficulties of communication in planning. The consumer cannot indicate his panning, the consumer cannot indicate his feelings over a large section of the built environment, because the decisions on the supply of facilities are mostly administrative and political. Frequently the required finance is provided through taxation, and this does not indicate how the consumer values the services given him. The use of marketing and quasi-marketing devices provide some indications of consumer valuing, but the development of reliable techniques for measuring value would still appear to be necessary. Popula tion, human activities, and national resources; the built environment and its resources; the availability of resources; scales, standards and forms of development; regional resources; and life styles, values and finance, are discussed. (Strachan-Chicago) W72-05563

AN INTEGRAL APPROACH TO URBAN WATER SUPPLY SYSTEMS, Kaiser Industries Corp., Oakland, Calif.

### Field 06-WATER RESOURCES PLANNING

### **Group 6B—Evaluation Process**

The Annals of Regional Science, Vol 3, No 1, p 115-124, June 1969. 2 tab, 6 ref.

Descriptors: \*Water supply, \*Sewage disposal, \*Costs, \*Economics, Desalination, Reclamation, Feasibility, Evaluation, Long-term planning,

Technology.

Identifiers: \*Integral approach, \*Urban, \*Economy of scale, Economy of scale, Economic feasibility, Optimal solution, Incremental cost, Alternatives.

New technologies for desalting sea water, sewage treatment, and reclamation are being developed, as the costs of both water supply and sewage disposal rise. With the economy of scale, the cost of desalination and reclamation is expected to reach a level of economic feasibility. An integrated approach is needed, evaluating the new possibili-ties in water supply, sewage disposal, reclamation, and desalinization to produce an optimal solution to water supply and sewage disposal of urban areas. Long range planning for urban water supply and sewage disposal systems must be considered together. An economic evaluation must compare the incremental cost of independent solutions to water supply and sewage disposal with the incremental cost of incorporating the two systems. It must further compare the incremental cost of introducing desalting under the alternative of sea water desalting reclamation blending and recycling of reclaimed water. Frequently, integral sol can be economically superior to the traditional methods of supplying additional water and satisfactory disposal of sewage. Factors include: the increasing costs of water supply, the increasing costs of sewage disposal, the economic feasibility of new technologies in reclamation and desalting, the open alternatives for urban water supply systems, and some of the effects of an inwater supply sewage disposal system. (Strachan-Chicago) W72-05565

### ENVIRONMENTAL POLLUTION, EXTERNALI-TIES, AND CONVENTIONAL ECONOMIC WISDOM: A CRITIQUE,

California Univ., Riverside. Dept. of Economics. R. C. Arge, and E. K. Hunt. Environmental Affairs, Vol 1, No 2, p 266-286,

June 1971. 23 ref. Descriptors: \*Economics, \*Environment, \*Pollu-

tion abatement, Planning, Conservation, Governments, Income, Expenditures, Behavior, Social aspects, Social values, Attitudes. Identifiers: \*Externalities, \*Conventional economic wisdom, \*Pollution, economic theory, Normative \*Traditional framework,

Cooperation, Doctrine of self-interest.

'Externalities' is defined as the ways in which acts of production, market transactions, or consuming affect people who are not directly involved in those acts. Conventional economic wisdom refers to the fact that the individual is unaware of how he is affecting the environment when he performs certain actions, and the fact that he is not made to pay for the pollution which he causes. In traditional economic theory, externalities have been treated as insignificant problems which can be easily resolved. The entire normative framework, which has been used in the past to deal with exter-nalities, is at least partially defective. Progress can not be made in understanding and resolving the social and economic problems of environmental pollution and degradation, unless the entire framework of reference towards externalities is reoriented. A brief sketch and critique of traditional economic approach to externalities is presented. Some improvements are suggested: (1) Government should view the pollution problem as one which belongs to the society as a whole. (2) A long-run prescriptive policy of limits on family income and expenditure should be given legislative consideration. (3) A change should be made in attitudes of social behavior which would make polluting an unacceptable social act. Economics continues to be oppressed by the doctrine of self-interest in its approach to pollution problems. The populace must be drawn away from this doctrine of self-interest, towards one which incorporates the notion of cooperation and conservation. (Strachan-Chicago) W72-05566

TOWARDS A RADICAL VIEW OF THE ECOLOGICAL CRISIS, Boston Coll., Chestnut Hill, Mass.

R. P. Lowry. Environmental Affairs, Vol 1, No 2, p 350-359,

June 1971, 4 ref.

Descriptors: \*Ecology, \*Environment, Resource allocation, Pollution abatement, Attitudes,

Planning, Conservation. Identifiers: \*Radical Identifiers: \*Radical ecological perspective, \*Popular wisdom, \*Ecological crusade, Problems and solutions, Responses, Beliefs and myths, Formulation.

Popular wisdom concerning ecological problems reflects three general perspectives: (1) an accidental or natural disaster theory of ecologically related catastrophies, (2) pollution is caused by the powerful and the powerless who pollute the en-vironment in small ways, which add up to a major problem, and (3) ecological crisis result from evil men in high places. None of these perspectives can lead to a fundamental response to the problems of pollution. There are five flaws in the current ecological crusade. (1) A pseudocommunity commitment and involvement can mask the extensive nature of the environmental problem. (2) The real problem is the necessity of resource reallocation.

(3) Community involvement to clean up the environment will accomplish no solutions to problems like racial tensions, etc. (4) The attempts to demythologize and depoliticize the current so-cial context by emphasizing an ecumenical and nonpartisan commitment to ecology are a cruel and dangerous hoax. (5) The popular ecology is essentially conservative in approach when a radical approach is demanded. A radical perspective assumes that the symptoms of environmental decay reflect root problems, and that these problems are created by the way people have chosen to live, play, work, and politic. Pollution is a consequence of contemporary life. The radical perspective proposed is a method of old myths and beliefs which may no longer be viable. In an open society, radical perspectives would engage leaders and citizens in debate and confrontation leading to the formulation of specific answers through social, political, and legal processes. (Strachan-Chicago) W72-05568

SOCIOLOGICAL ASPECTS OF WATER DEVELOPMENT,

Department of Environment, Ottawa (Ontario). Policy Research and Coordination Branch. A. K. Biswas, and R. W. Durie.

Water Resources Bulletin, Vol 7, No 6, p 1137-1143, December 1971. 15 ref.

Descriptors: \*Water resources development, \*Planning, \*Social aspects, \*Decision making, \*Social impact, Social needs, Economic justification, Financial feasibility, Management, Evaluation, Technical feasibility, Construction, Operation and maintenance.

\*Water Identifiers: resource management. \*Planning process, \*Public involvement, \*Sociological feasibility, Public acceptance, \*Planning Public understanding.

Decisions to develop water resources systems so far have been primarily taken on the basis of engineering and economic feasibilities. Very rarely sociological feasibility has been considered, except in a very broad sense. Planning is for the people and it should improve the quality of life. Hence, it is argued that water resources decisions ought to be primarily social ones, and that the suc-cess or failure of any resource development should not only be judged by its techno-economic excellence but also by its impact on people. The water resources planning process is discussed, and the difficulties associated with the evaluation of soliological feasibility of projects are enumerated. The social consequences of water development projects are traced through planning, construction, operation and management impacts. Finally, it is suggested that the foremost factor in the success of any water management program is the public understanding and acceptance of that program. (Davis-Chicago) W72-05571

ECONOMICS AND FEDERAL WATER PRO-

Arizona State Univ., Tempe. Dept. of Economics. M. T. Farris.

Water Resources Bulletin, Vol 7, No 6, p 1128-1136, December 1971, 8 ref.

Descriptors: \*Economics, \*Federal government, \*Economic justification, \*Methodology, \*Analytic techniques, \*Water resources devel ment, Federal project policy, Evaluati Benefits, Social aspects, Political aspects. Evaluation. Identifiers: \*Federal water projects, \*Economic feasibility, Economic institutions, Market mechanism, Rationing agent, Price, Distribution

While the science of economics is widely used in Federal water resource development projects, the usual procedure of applying an analytical discipline to arrive at a conclusion is reversed. The 'answer' is usually provided ahead of time and economics is assigned the task of justifying the preconceived conclusion. This leads to a series of mitigatory effects in which economics as a science is not allowed to freely function. Some of these 'unusual' uses of economics in Federal water pro-jects are illustrated and 'answers' logically expected from the economic discipline are noted. Even though the theory of economics is often sub-verted, there are positive aspects to the role of economics in evaluating Federal water projects. Several problem areas are discussed: economic institutions and their universality, the operation of the market mechanism, multi-level use complication, multiple or complementary use complication, price as a rationing agent for water, price as an al-location or investment decision tool, price as a distribution agent or measure of benefits, and finally, social, political and selfare mitigatory effects. (Davis-Chicago) W72-05572

THE MERRIMACK TAPES,

agent. Public welfare.

Corps of Engineers, New York. North Atlantic Div For primary bibliographic entry see Field 05D. W72-05577

POPULATION CONTROL: ULTIMATE NECES-SITY IN WATER RESOURCE MANAGEMENT, Heller, Ehrman, White and McAuliffe, San Francisco, Calif. W. M. Chamberlain.

Water Spectrum, Vol. 3, No. 4, p 19-23, Winter 1971-72. 3 fig.

Descriptors: \*Population, \*Social impact, \*Water resources development, \*Water supply, Technology, Planning, DDT, Estimating, Mortality. Identifiers: \*Zero population growth, \*Population increase, \*Population pressure, Alleviation, Policy

The effects of continuing population increase on the problem of water supply are examined, and possible approaches the government could take to permanently alleviate the threat of population pressure are discussed. The deleterious effects of population pressure are not restricted to water upply. It is possible that the pressure of population increase could create demands on the water resource which would lead to a sacrifice of sound

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management practices. The need to achieve a zero management placetes. The need a state of a con-rate of population growth is urgent, and programs towards its achievement should begin soon. The case of DDT is used as an example of heavy reliance upon technology to provide instant soluremance upon technology to provide instant solu-tions to problems, which resulted in unforescen results. The author suggests that reliance upon man's technological abilities has produced an at-titude of nonchalance towards the problem of population increase. In the face of uncertainty as to whether sufficient advances will occur in ti to prevent increases in mortality, the author suggests that conservative estimates should be made in determining time remaining in which to achieve zero growth. (Strachan-Chicago) W72-05580

PORT GROWTH POLICIES ABROAD, Little (Arthur D.), Inc., Cambridge, Mass. B. de Frondeville. Water Spectrum, Vol. 3, No. 4, p 1-8, Winter 1971-

72. 6 photo, 2 fig.

Descriptors: \*Harbors, \*Planning, \*Decision mak-

Descriptors: "Harbors, "Planning, "Decision making, "Social aspects, "Economics, "Political aspects, "Environmental effects.

Identifiers: "Port growth policies, "Port development, "Policy making, Tankers, Bulk carriers, Shallow-craft fleet, Port-industrial complex, World week. World trade.

Some findings and suggestions are reported of a six month study made by the Arthur D. Little Company, Inc. of the deep-water ports in Europe, the Middle East, Canada, Japan, and Australia. Generally, the study examined the interrelationships among engineering, environmental, socioeconomic and political aspects of port development; identified the socio-economic and environmental consequences of port deepening and preserved the negative and positive aspects of and preserve the legacity and positive aspects of each approach. Certain alternatives particularly applicable to the situation of the United States are discussed and evaluated: (1) the do-nothing approach, (2) lightened tankers and bulk carriers (3) expansion and utilization of certain ports outside the U.S. coastal zone (4) subsidy of a new, shallow-craft fleet (5) deepening and expanding existing port-industrial complexes (6) development of a new United States deep-water port-industrial com-plex. Success of a national port strategy depends upon continued participation in the planning process by all concerned interests, public and private. Implementation of a port development strategy is necessary if the United States is to maintain its position in world trade and also address itself to the relevant environmental and economic issues. (Strachan-Chicago) W72-05581

THE SPLENDID BUT SUPERFICIAL CON-TRIBUTION OF CONVENTIONAL ECONOMIC ANALYSIS TO THE MANAGEMENT OF PUBLIC RESOURCES,

ECONOMIC RESOURCES, Economic Research Service, Fort Collins, Colo.; and Bureau of Land Management, Denver, Colo. J. A. Munger, and J. D. Edwards. The Annals of Regional Science, Vol. 4, No. 1, p 29-37, 1970. 1 fig, 6 ref.

Descriptors: \*Economics, \*Analysis, \*Water resources development, \*Resource allocation, Descriptors: \*\*Leconomics, \*\*Analysis, \*\*Water resources development, \*Resource allocation, \*Cost-benefit analysis, Planning, Decision making, Efficiencies, Multiple-purpose projects, Political aspects.

\*Conventional economic analysis. Identifiers: Public resource management, \*Efficiency criterion, \*Marginal calculus, Bureau of Land Management (BLM), Incidence.

Conventional economic analysis refers to the common practice of determining an optimum alloca-tion of resources based on an efficiency criterion and using marginal calculus. This special and limited form of economic analysis has become so standardized in benefit-cost studies of Federal resource investment alternatives (especially in the area of water development) as to virtually rule out other, and more useful, forms of analysis. The authors argue that information contained in conventional benefit-cost analysis does not dispel the uncertainty regarding the consequences of alterna-tive lines of action, is sometimes misleading, and tends to inhibit the search for acceptable alternatives. The argument is based on the author's experience in helping to design, test and implement a comprehensive planning system for use by the U.S. Department of the Interior's Bureau of Land Management (BLM) and is supported by examples drawn from this experience. Among the subjects discussed are: the nature and scope of BLM activities, planning as a management tool, economic efficiency as a guide to planning, incidence rather than efficiency. The authors conclude that if the economist is to be more useful in the planning process, he will have to determine what people want and how they go about satisfying these wants. The economist will have to abandon exclusive reliance on an analytical tool designed to guide private managerial decisions, and instead, develop tools capable of guiding public decisions aimed at achieving multiple objectives. Further, he must remember that the search for acceptable alternatives is a political bargaining process. (Strachan-Chicago) W72-05582

BENEFITS OF WATER QUALITY ENHANCE-

Syracuse Univ., N.Y. Dept. of Civil Engineering. For primary bibliographic entry see Field 05G. W72-05666

THE ECONOMICS OF WATER-BASED OUT-DOOR RECREATION: A SURVEY AND CRITIQUE OF RECENT DEVELOPMENTS, Cornell Univ., Ithaca, N.Y.

R. J. Kalter. Available from National Technical Information Service, Springfield, Va. 22151. U.S. Army En-gineer Institute for Water Resources, Report 71-8, March 1971. 192 p, 2 fig, 1 tab, 237 ref. DACW31-

Descriptors: \*Recreation, \*Water resources, \*Economics, \*Recreation demand, Cost-benefit analysis, Planning, Investment, Regional analysis, Economic impact.
Identifiers: \*Literature survey.

Recent economic research pertinent to outdoor recreation is reviewed, summarized, and critiqued with a focus on public policy issues important to the planning and evaluation of potential alternative government actions. The survey begins with the basic concept underlying most recreation investment evaluation questions, that is, the accurate forecasting of recreation demand for the proposed investment site, other factors remaining constant. Models of consumer behavior are considered, and methods of estimating primary benefits of public investment in recreational facilities are suggested. Second, a discussion of supply concepts with respect to outdoor recreation is undertaken primarily to show the relationship between site capacity and demand functions in the investment evaluation process. Third, a survey and critique similar to that done on site demand relationships is conducted on recent research pertaining to market or population centered demand functions. This survey highlights possible alternative methods with which to evaluate specific project proposals. Fourth, the literature pertaining to the impact of recreation development on regional growth is analyzed. Finally, the impact of recreation development on income distribution is discussed. (Settle-Wisconsin) W72-05668

ECONOMICS OF NATURAL RESOURCE DEVELOPMENT IN THE WEST, CRITERIA FOR ALLOCATION OF RESOURCES TO PRI-RESEARCH AREAS, EMERGING

PROBLEMS IN NATURAL RESOURCE ECONOMICS, Western Agricultural Economics Research Coun cil. Committee on the Economics of Natural Resources Development.

Conference Proceedings, Committee on the Economics of Natural Resources Development of the Western Agricultural Economics Research Council, San Francisco, California, October 26-28, 1970. E Boyd Wennergren and Darwin B. Niel-son, editors, Utah State University, Logan. Re-port No 1, 1970. 136 p, 3 fig, 3 tab, 58 ref.

Descriptors: \*Planning, \*Water resources development, \*Urbanization, \*Land use, \*Land resources, Recreation demand, \*Economic efficiency, Cost-benefit analysis, Evaluation, Economics, \*Natural resources. Identifiers: Natural resources research. \*Research

The process of setting priorities in research, and emerging topics in the field of natural resource economics were reviewed at a conference spon-sored by The Committee on Economics of Natural Resource Development. Issues and problems that arise due to growing urban and recreational de-mands being made upon land were discussed. (See also W72-05671 thru W72-05675) W72-05670

DELINEATING TARGETS FOR NATURAL RESOURCES RESEARCH, Resources for the Future, Inc., Washington, D.C.

In: Economics of Natural Resource Development in the West, Conference Proceedings of the Committee on the Economics of Natural Resources
Development of the Western Agricultural
Economics Research Council, October 26-28, 1970, San Francisco, California, Report No 1, p 1-

Descriptors: \*Planning, Management, Water resources development, Natural resources. Identifiers: Natural resources research, \*Research targets, \*Research objectives.

Systematic inquiry requires that research targets be used whether in a conscious and consistent fashion or not. Research targets help in evolving the definition of fields of inquiry and providing criteria and guidelines for both the conduct and management of research. Targets must be both consistent with the taxonomy we use in referring to contemporary problems, and operationally workable from the standpoint of a research enterprise. In this sense a research target is a function both of the domain of perceived problems and the structure of the research which addresses them. Should the target lack congruency with the problem, the ensuing research may not contribute directly to a rational solution. If the target is inoperable, it will not provide the type of guidelines and allocation criteria that are useful. The concept of research targets should prove helpful in (1) broadening objective functions for resources management; (2) studying the institutional arrangements through which decisions are reached, programs formulated, executed, and modified; and (3) evaluating recreational opportunities, scenic highways, and plans to preserve community or urban amenities, among others. A conference discussant emphasized the role of the research manager in guiding an organization's research. (See also W72-05670) (Settle-Wisconsin) W72-05671

A 'DISJOINTED INCREMENTALIST'S' AP-PROACH TO MEASURING RESEARCH BENEFITS AND COSTS, Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.

In: Economics of Natural Resource Development in the West, Conference Proceedings of the Com-

### Field 06—WATER RESOURCES PLANNING

### **Group 6B—Evaluation Process**

mittee on the Economics of Natural Resources Development of the Western Agricultural Economics Research Council, October 26-28, 1970, San Francisco, California, Report No 1, p 21-59, 1 tab, 12 ref.

Descriptors: \*Cost-benefit analysis, \*Measurement, \*Planning, \*Data processing, Val \*Resource allocation, Economic efficiency. Identifiers: \*Information systems development.

The Minnesota Agricultural Research Resource Allocation System is a computer-based structure for collecting and processing information relevant to resource allocation decisions under situations characterized by a high degree of uncertainty. Its primary aim is to generate relative measurements of costs and benefits of proposed research activities which are supposed to lead to more efficient allocation of research resources within an organization. The task is disassembled into information components which permits collection from the best possible sources of the individual segments of information independently of other segments, and permits effective separation of the data-collecting and analysis procedures. The System was designed to also generate information about such significant factors as the feasibility of achieving research objectives, the feasibility and cost of implementing new knowledge generated, and the degree of substitutability, complementarity, and synergism among alternative research activities. A conference discussant mentioned some of the inherent weaknesses found in any cost-benefit analysis: (1) benefit minus cost criteria favor larger projects, (2) a discount rate must be chosen, (3) intangible values must be estimated, and (4) numerous subjective estimates must be incorporated into the analysis. (See also W72-05670) (Settle-Wisconsin) W72-05672

### PARKS AND PARKWAYS,

California Univ., Davis. Dept. of Economics. K. D. Goldin.

In: Economics of Natural Resource Development in the West, Conference Proceedings of the Committee on the Economics of Natural Resources Development of the Western Agricultural Economics Research Council, October 26-28, 1970, San Francisco, California, Report No 1, p 61-82. 3 fig, 2 tab, 10 ref.

Descriptors: \*Parks, \*Management, \*Economic efficiency, Recreation demand, Supply, Cost-benefit analysis, Marginal costs. Identifiers: \*Joint supply, Quality diversity, Peak demand, Empirical research.

A park or campsite, once produced, provides capacity during each of the 365 days of the year. This is a set of 365 essentially different products which are equally available, but for which consumer demand varies widely. Thus, the problems of peak demand and quality diversity need to be analyzed within the framework of 'joint supply in fixed proportions.' Analysis of these problems may be expedited by quantifying the quality aspects of parks. Four readily quantifiable quality aspects are use intensity quality diversity park aspects are use intensity, quality diversity, park improvements, and location. Empirical research would also be very useful in these problem areas. It would be helpful, for instance, to estimate which is more efficient, a system of efficient production, efficient distribution and quality diversity, or the present system of unrestricted entry, first-come, first-served, and semi-uniform quality. Research might well suggest, for example, that remote parks are best left with minimum management. A second empirical might be that of finding the most efficient system of management control. We need to know, for example, whether a government agency is likely in practice to improve upon imperfect markets before we recommend that the agency replace the market. (See also W72-05670) (Settle-Wisconsin) W72-05673

LAND USE CONFLICT AND PUBLIC POLICY. California Univ., Davis. Dept. of Economics. V. Goldberg.

Descriptors: \*Urbanization, \*Land development, \*Rural areas, \*Land use, Economic efficiency, Economic impact.

Identifiers: \*Land markets, \*Market failure, Externality, Private property, Urban development.

Urban fringe land markets may fail to equate private and social interests. One possible reason for this market failure might be an externality. Urban uses may be incompatible with contiguous commercial agriculture: crop dusting, for exam-ple, may not bother other farmers but does upset suburban residents. A conflict may also develop between urban development and wildlife preserves. For the non-migratory wildlife there would appear to be no problem. Ownership of land usually includes the right to manage the wildlife asset as the owner sees fit. For migratory wildlife, however, this arrangement would not work. The relationship between space and structure in an urban area also affects the welfare of the citizens both directly by making life more or less pleasant and indirectly by influencing their productivity. Areas of possible research relating to urban fringe land markets include (1) the political economy of land use controls, and (2) the measurement of benefits of difficult-to-quantify items. A con-ference discussant emphasized the vagueness of the 'urban fringe land market' concept and the limitations of economic analysis for explaining divergencies between private and public interests. (See also W72-05670) (Settle-Wisconsin) W72-05674

STANDARDS PRINCIPLES AND PLANNING WATER AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES: A REVIEW AND EVALUATION, Economic Research Service, Washington, D.C. Natural Resources Economics Div. S. F. Miller.

In: Economics of Natural Resource Development in the West, Conference Proceedings of the Committee on the Economics of Natural Resources Development of the Western Agricultural Economics Research Council, October 26-28, 1970, San Francisco, California, Report No 1, p

\*Planning, \*Water Descriptors: resources development, \*Land resources, Cost-benefit anal-ysis, Cost allocation, Cost sharing, Intangible costs, Intangible benefits.
Identifiers: \*Water Resources Council.

The Special Task Force to the Water Resources Council has recently completed two reports con-cerned with principles and standards for planning water and land resources. The reports may be credited with broadening the planning objectives, developing and making available alternative plans to meet objectives, improving the reliability of the national economic development account, and broadening the planning participation. However, the reports also suffer from several weaknesses. They fail to exhaust the list of possible relevant criteria and objectives of society. The planning alternatives they suggest are, unfortunately, limited to structural and nonstructural development of water and related resources. No guidance is given on appropriate weights to be used for different objectives. The reports' general guidelines for cost allocation appear inconsistent with the cost allocation method suggested. The reports' cost alloca-tion procedures also leave unanswered the question of how the actual payment mechanism is to function. The methods for evaluating nonmone-tary objectives is not clearly specified either. Inadequate recognition is given to recent methodologic advances in the evaluation of public goods. A final example of the many shortcomings is the fact that the evaluation of well-being and enprimitive. (See also W72-05670) (Settle-Wisconsin) W72-05675 THE PRACTICAL USES OF PLANNING THEORY, California Univ., Berkeley.

J. W. Dyckman.

Journal of the American Institute of Planners, Vol. 35, No. 5, p 288-300, September 1969. 11 ref.

Descriptors: \*Planning, \*Decision making, Professional societies, Professional personnel, Model studies, Mathematical models, Mode of action, Application methods, Social aspects. Identifiers: \*Planning theory, \*Planners, Formal models, Theory of action, Comprehensive plan, Technical aspects.

The usefulness of any theory of planning is questioned by many, either because their operational approach is purely pragmatic, or because their world view is one in which planning plays a marginal and determined role. Many professional planners also question the usefulness of planning planners also question the usertuness of planning theory. The emphasis of theoretical literature on mathematical or logical models of rational decision making, and the unrealistic requirements that former models place on normative decision are two factors which contribute to the disenchantment of planners with planning theory. The planner must have a theory of action and decision that he can use to defend his intervention. The comprehensive plan remains the overriding symcomprehensive plan remains the overrating sym-bol to which city planners cling. Considering im-pediments to application of planning-style decision making to world affairs, two alternatives are sug-gested: (1) a retreat from the present basis of professionalism to other bases, such as architecture, engineering, or urban studies, and thereby, giving up any pretension of offering a superior mode of public action and emphasizing some in-strumental technical action, and (2) a modification of normative public action. Planning is an art striving by scientific means to improve itself. For planning to become an important societal tool, the panning to become an important societal tool, the society using it must be (a) technically competent, and (b) politically well-organized and enthusiastic about applying planning. (Strachan-Chicago) W72-05691

#### MODELS IN URBAN PLANNING: A SYNOPTIC REVIEW OF RECENT LITERATURE,

Centre for Environmental Studies, London (En-A. G. Wilson.

Urban Studies, Vol. 5, No. 3, p 249-275, November 1968. 3 fig, 88 ref.

Descriptors: \*City planning, \*Decision making, \*Model studies, Design, Construction, Technology, Population, Economics, Transportation, SoA Id A N A tid \$0 R IS

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cial aspects.

Identifiers: \*Urban planning, \*Urban planning literature, \*Conceptual framework, Hierarchical relevance tree, Urban systems, Urban structure, Social systems

A rudimentary conceptual framework for planning, within which the use of models can be studied is described. This framework is based on students described. This influence is based on systems which can be usefully modelled are delineated, rules for model design are given and some technique problems associated with model construction are discussed. It is argued that models are developed at lower leads in such a such as models are developed at lower levels in such a hierarchy to represent understanding of the systems being planned. The recent literature on the development of such models is reviewed. This covers model development for spatially ag-gregated population and economic systems, urban structure, transport, and more briefly, social systems. Finally, the possible applications of models in the design process and the higher levels of the planning process are discussed. (Strachan-Chicago) W72-05692

WATER AND RELATED LAND RESOURCES PLANNING, A POLICY STATEMENT.
Water Resources Council, Washington, D.C.

July 22, 1970. 5 p.

Descriptors: \*Water resources development, \*Project planning, \*Water policy, \*Water conservation, \*Long-term planning, Federal project polvauon, Long-term pianning, reuera project poi-icy, Federal government, State governments, Local governments, Jurisdiction, Administration, Administrative agencies, Public health, Legal aspects, Programs, Water demand, Water resources, Water utilization, Water supply,

Congress has declared, in the Water Resources Planning Act, a policy of encouraging the conservation, development, and utilization of water and related land resources on a comprehensive and coordinated basis. The objectives of such planning are to provide a guide for federal, state, and local interests to conserve, develop, and utilize water and related land resources in an efficient and timely manner. Such planning should provide a sound basis for rational decisions. Another major objec-tive is the achievement of joint plans or programs to identify the role each governmental unit is to play. Three levels of planning are recommended to accomplish these goals. Framework studies and assessments are merged into the first broad level of planning which is designed to appraise national long-term needs. Regional or river basin plans act as a preliminary plan for a selected region, while focusing on the middle term of 15 to 25 years. Finally, implementation studies, undertaken by a single federal, state, or local agency, focus upon 10 to 15 year needs to determine program feasibility. Multi-agency planning shall be performed under the guidance of the Water Resources Council. (See also W70-10363) (Horwitz-Florida) W72-05757

SAN FRANCISCO BAY-DELTA WATER QUALITY CONTROL PROGRAM, California State Water Resources Control Board,

Sacramento. San Francisco Bay-Delta Program. For primary bibliographic entry see Field 05G.

### AN ANALYSIS OF THE ECONOMIC IMPLICA-TIONS OF THE PERMIT SYSTEM OF WATER ALLOCATION, Iowa State Water Resources Research Inst.

N. E. Harl, R. A. Baldwin, and D. W. Hubly. Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-207 476, \$3.00 in paper copy, \$0.95 in microfiche. Iowa Water Resources Research Institute, Ames, Completion Report ISWRRI-43, November 1971. 261 p, 7 fig, 27 tab, 122 ref, 8 append. OWRR B-009-IA (2).

Descriptors: \*Permit system. Economic efficiency, Water quality, Water resource investment, \*Iowa, \*Model studies, \*Cost analysis, \*Water allocation (Policy), Competing uses, Legal aspects, \*Linear programming, Cost allocation, Evalua-

The study contains three parts. In Part I, the literature of water allocation is reviewed and the permit system of administrative allocation is analyzed in terms of rational guidelines for allocating water as a scarce resource among competing alternatives. Special attention was given to the Iowa permit system, with the conclusion that the system acknowledges only two consistently identified points on a water user's production function (1) the point of zero output and zero water use, and (2) the point of maximum total product where the marginal physical product becomes zero. The system guidelines are insufficient for allocating water on efficiency bases if supply is limited and maximum physical productivity from water as a variable input is unattainable. In an effort to generate information about water productivities, to the end that additional points on the production function might be identified administratively as permits are granted under conditions of limited water supply in a particular area, a general model is constructed in Part II using a linear programming approach to resource allocation within an identified hydrologic area. In Part III, the general model was extended and refined to include detailed water quality considerations using both linear programming and simulation. The resulting Tandem Program Systems (TPS) Model makes possible cost adjustments in producing activities based upon the character of the wastes produced thereby, the assimilative nature of the stream and the treatment costs for maintaining a pre-deter-mined level of water quality in the stream. Data from both the general model and the TPS model are presented. (Powell-Iowa State) W72-05839

WATER RESOURCES AND THEIR USE (VOD-NYYE RESURSY I IKH ISPOL'ZOVANIYE). Belorusskii Nauchno-Issledovatelskii Institut Melioratsii i Vodnogo Khozyaistva, Minsk

Izdatel'stvo 'Nauka i Tekhnika', Minsk, Gatillo, P.D., and others, editors, 1970. 200 p.

Descriptors: \*Water resources, \*Water utilization, \*Water consumption (except consumptive use), \*Water conservation, \*Water pollution control, Water policy, Water supply, Channel morphology, Channel flow, Streamflow, Runoff, Groundwater, use, Drainage programs, Estimating, tion, Planning, Forecasting, Statistical Evaluation.

Evaluation, Tailining, Potestating, Britansian, Britansian, Britansian, Identifiers: \*USSR, Belorussia, East Germany, West Germany, Urban hydrology, Infiltration gal-

This collection of 21 papers examines various aspects of the complex-use management of water resources of the USSR. Indices of the effectiveness of actual use of water resources are analyzed in terms of their conservation and development and preventive pollution control planning to maintain and improve water quality. Criteria and poli-cies for land and water use in zones of excess moisture, methods for calculating surface-water and groundwater runoff, and plans for optimum use of water supply and velocity structure of flows in open channels are discussed. The text is of particular value to workers in production, planning and research organizations, and to instructors and students of educational establishments. (Josefson-W72-05859

#### RESOURCE PROBLEMS WATER RESEARCH NEEDS OF NORTH CAROLINA, North Carolina Water Resources Research Inst., Raleigh.

David H. Howells.

Available from the National Technical Information Service as PB-207 479, \$3.00 in paper copy, \$0.95 in microfiche. UNC-WRRI-72-02, Report No. 2 (revised) January 1, 1972, 49 p. OWRR A-999-NC (28).

Descriptors: \*Water resources development conservation, Planning, Water quality control, Groundwater, Surface waters, \*Research and development, \*North Carolina, \*Water Resources Institute, Universities, Colleges, Training.

This report is a summary of North Carolina's water resource problems and research needs and was prepared as a source of orientation for the Inwas prepared as a source of orientation for the Institute's research program. The subject matter is presented within the four broad categories of water resource planning, water quality management, water quantity management, and water research application. The problems and needs discussed herein represent those areas in which the Institute is attempting to encourage a research response from potential investigators. Current and needed studies and research referred to in this report reflect the collective statewide effort of public agencies, industry, and the university community. Sixty-three research needs are listed in the W72-05870

### 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

INTERNATIONAL SURVEY ON MANAGE-MENT OF ARTIFICIAL RECHARGE - ANALY-SIS AND SYNTHESIS OF RESPONSES (INVEN-TAIRE INTERNATIONAL DES AMENAGE-MENTS D'ALIMENTATION ARTIFICIELLE -DEPOUILLEMENT ET SYNTHESE RESPONSES), Burgeap S.A., Paris (France).

For primary bibliographic entry see Field 04B. W72-05331

### WATER RIGHTS AND WRONGS,

Arizona State Univ., Tempe. Dept. of Economics. For primary bibliographic entry see Field 06E.

AN ECONOMIC ANALYSIS OF POULTRY PROCESSING WASTEWATER IN DELAWARE, Delaware Univ., Newark. Dept. of Agricultural and Food Economics. For primary bibliographic entry see Field 05B. W72-05659

#### AN AXIOMATIC APPROACH TO COST ALLO-CATION FOR PUBLIC INVESTMENT,

Florida Univ., Gainesville. Dept. of Agricultural Economics; and Krannert Graduate School of Industrial Administration, Lafayette, Ind. E. Loehman, and A. Whinston.

Office of Water Resources Research Research Report. 16 p, 7 ref. OWRR B-020-IND (10).

Descriptors: \*Cost allocation, \*Investment, \*Public utilities, \*Mathematical models, Joint costs, Economic efficiency, Welfare (Economics). Identifiers: \*User charges.

A cost allocation scheme for public investments is derived from the following set of axioms: (1) user charges must cover costs, (2) a user's charges are to be based on the incremental social costs caused by that user, (3) the user charge is independent of labelling or ordering of users, (4) if a user increases his demands so that incremental costs increase by some amount, then his charge will also increase by that amount; that is, the charge is homogeneous of degree one in the incremental costs. If would-be users of a collective facility agree that these axioms are fair and reasonable and should be accepted as a constitution, then they must agree to a particular cost allocation scheme This scheme has several desirable features: (1) it gives a meaningful definition of incremental cost in the case of joint costs; (2) it satisfies the necessary conditions for welfare maximization at the gin; and (3) under economies of scale it can result in a vector maximum of net benefits for users under the constraint that total costs are covered and income not redistributed. Several examples illustrate the usefulness of this cost allocation scheme. (Settle-Wisconsin) W72-05660

#### ENVIRONMENTAL PROTECTION MINIMUM COST

New Jersey State Economic Policy Council. W. J. Baumol.

The American Journal of Economics and Sociology, Vol 30, No 4, p 337-343, October, 1971.

Descriptors: \*Pollution abatement, \*Taxes, \*Economic efficiency, Regulation, Government Identifiers: \*User charges, Incentives, Minimum social cost, Equity.

Four proposals for the control of pollution and other environmental problems are analyzed. These proposals include (1) moral suasion, (2) governmental outlays to protect the environment, (3) direct controls, and (4) tax incentives. The first

### Field 06-WATER RESOURCES PLANNING

### Group 6C—Cost Allocation, Cost Sharing, Pricing/Repayment

three approaches seem incapable of doing an effective job of cleaning up our environment. The tax reorientation approach, however, offers a variety of attractive features. It is equitable since it charges only those who engage in polluting activities and bases the charges on the extent of the taxpayer's contribution to environmental problems. Second, it is automatic and self-enforcing, thus minimizing the need for enforcement machinery and the temptations for corruption. machinery and the temptations for corruption. Third, the tax incentive approach will not increase the financial problems of state and local governments. Fourth, it is economically efficient and makes full use of the productive efficiency of the free enterprise system. Finally, its effects are long-lived, and it promises to achieve its goals at minimum overall cost to the economy. Proper use of the tax incentive approach will ensure that valuable but, in many instances, free resources are priced to reflect their value to society. (Settle-Wisconsin)

RATE SURCHARGES: FRIEND OR FOE, Monsanto Enviro-Chem Systems, Inc., Chicago, Ill. Industrial Water Pollution Control Dept. For primary bibliographic entry see Field 05G. W72-05663

UNIT PRICING CHALLENGES TRADITIONAL BLOCK-RATE METHOD, Delaware Univ., Newark. Urban Affairs Div.

M. R. Brams.

Water and Wastes Engineering, Vol 8, No 11, p 36-39, November 1971. 4 tab.

Descriptors: \*Water rates, \*Unit costs, \*Joint costs, Benefits, Costs. Identifiers: \*Block-rate pricing, \*Unit pricing.

Unit pricing in the water industry holds greater promise than the traditional block rates as a device for short-run adjustments to equate quantities supplied and quantities demanded while at the same time providing a no less equitable allocation of costs to users. Block rates purport to charge classes of users in proportion to the cost of serving them. However, this goal is, in general, unattainable because joint costs must to some extent be arbitrarily allocated. Unit pricing can recognize dif-ferences in the direct cost of providing service while relying on proportionate consumption as the basis for allocating joint costs instead of relying on bases used in block-rate pricing. This allocation of joint costs establishes a rough relationship between the benefits received by users and the cost imposed upon them. Three variations of unit pricing were examined with the aid of a hypothetical water system comprised of two service areas, each of which has only two classes of users, re-sidential and non-residential. The first scheme produced one unit price for all customers, the second produced a distinct unit price for each service area, and the third produced two distinct unit prices for each service area. (Settle-Wisconsin) W72-05664

ECONOMIC GROWTH AND ECOLOGY-AN ECONOMIST'S VIEW

Minnesota Univ., Minneapolis. Dept. of Economics. W W Heller

Monthly Labor Review, Vol 94, No 11, p 14-21, November 1971. 10 ref.

Descriptors: \*Pollution abatement, \*Economic impact, \*Cost-benefit analysis, \*Economic evaluation, Social impact, Economics, Taxes, Environ-

Identifiers: \*Economic growth, \*Full-cost pricing

In the field of environmental control the economist believes he can contribute to a better understanding of how the market pricing system and economic growth can be made to work for us in the battle to protect our natural environment

and improve the quality of our existence. To clean up our environment we will have to call on the tax-payer (1) to foot huge bills if we are to overcome our past neglect and (2) to finance future collective waste treatment and preserve open space and wilderness. We will also have to require producers and consumers to bear the brunt of outright bans on ecologically dangerous materials and to pay rent for the use of the environment's waste assimilation services. If we are to cope with these huge costs, it seems a virtual necessity that economic growth continue. Our environmental problems arise primarily from the way we grow and the uses we make of our growth. Consequently, we need to concern ourselves more with changing the forms and uses of growth and less with the growth-environment trade-off. An increased reliance on full-cost pricing, for example, would be a major incentive for the development of pollution-abatement technology. (Settle-Wisconsin) W72-05665

### BENEFITS OF WATER QUALITY ENHANCE-

Syracuse Univ., N.Y. Dept. of Civil Engineering. For primary bibliographic entry see Field 05G. W72-05666

**FACTORS** AFFECTING POLLUTION REFERENDA.

Abt Associates, Inc., Cambridge, Mass. For primary bibliographic entry see Field 05G. W72-05669

#### 6D. Water Demand

LOSS LEVELS, United States Lake Survey, Detroit, Mich. For primary bibliographic entry see Field 06E. W72-05579

SCIENTIFIC FRAMEWORK OF WORLD WATER BALANCE.

For primary bibliographic entry see Field 02A. W72-05650

THE ECONOMICS OF WATER-BASED OUT-DOOR RECREATION: A SURVEY AND CRITIQUE OF RECENT DEVELOPMENTS, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 06B. W72-05668

PARKS AND PARKWAYS, California Univ., Davis. Dept. of Economics. For primary bibliographic entry see Field 06B.

COMPREHENSIVE WATER AND SEWER

PLAN, 1970-1990, L. B. Stuart. Available from the National Technical Informa tion Service as PB-201 468, \$3.00 in paper copy, \$0.95 in microfiche. Upper Cumberland Development District, Tennessee Technological University, Cookeville, June 30, 1971. 197 p, 72 fig, 15 tab. HUD TN-UPPD-0-71-129-4.

Descriptors: \*Planning, \*Regional analysis, \*Water resources development, \*Water supply, \*Sewerage, Drainage systems, Drainage programs, Cities, Urbanization, Coordination, Longgrams, Critical States of Confidencial Congressions, Conditional Programs, Grants, Project planning, Tennessee.

Identifiers: Comprehensive plan.

The purpose of this plan is to determine the adequacy or inadequacy of the existing utilities in the Upper Cumberland Development District and to determine the improvements necessary to

eliminate present deficiencies, as well as project future improvements that will accommodate the anticipated growth of the communities of the District. The utilities to be included in this plan are the trict. The utilities to be included in this plan are the water, sanitary sewerage, and storm sewerage systems. The Upper Cumberland Development District, (UCDD) located in north-central Tennessee, comprises 14 Appalachian Counties, covers 5,093 square miles, and includes a present population of approximately 195,000. The following counties make up the UCDD; Cannon, Clay, Cumberland, DeKalb, Fentress, Jackson, Macon, Overton, Pickett, Putnam, Smith, Van Buren, Warren, and White. It is recommended that the various utility districts, including water, electric various utility districts, including water, electric and others, which are in close proximity of each other, work together to formulate a cooperative effort to perform the necessary administrative functions. This could mean the difference between operating in the red or in the black in some instances. Most of the municipalities with popula-tions to warrant public sewerage systems have some type system. The towns that do not have systems should be served within the next ten years if this plan is implemented. Some systems need and this plan is implemented. Some systems need major additions and expansions at the present time, but the majority of the existing systems will be adequate for the scope of this plan. Storm sewerage systems in the UCDD are practically non-existent. (Poertner)

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Property Washington

COMPREHENSIVE PLAN FOR WATER AND SANITARY SEWER SYSTEMS IN THE MIDDLE GEORGIA AREA.

Briley, Wild and Associates, Daytona Beach, Fla.

Available from the National Technical Information Service as PB-201 065, \$3.00 in paper copy, \$0.95 in microfiche. Middle Georgia Area Planning Commission, Macon, April 1971. 238 p, 14 fig, 23 tab. UPA GA. P153, (HUD).

Descriptors: \*Planning, \*Regional analysis, \*Georgia, \*Water resources development, \*Water supply, \*Sewerage, Cities, Urbanization, Coor-\*Planning, dination, Long-term planning, Water demand, Forecasting, Programs, Grants, Project planning. Identifiers: \*Comprehensive plan.

The comprehensive plan recommends the water and sanitary sewerage system activities that should be implemented under a 2-, a 6- and a 12year program. The plan is intended for use as a broad based administrative tool and its value will be determined by the manner in which it is used. The primary objectives include: (1) the main tenance of a continuous and adequate supply of safe and potable water to everyone in the area; and (2) the disposal of all domestic liquid waste in such a manner as to protect the public health and prevent the creation of public nuisances. The report, which covers a 7-county area in middle Geor-gia surrounding Macon, includes the following general recommendations: (1) consolidation of private water and sewer systems under public ownership and management; and (2) county owned water and sewer systems serving unincorporated areas. The report develops and discusses: (1) criteria for treatment and disposal of waste water; (2) general locations for pollution control facilities, outfall sewers, transmission mains and well fields: (3) administrative review procedures for use dur-(5) administrative review procedures for use during plan implementation, suggested administrative policies; (4) a program for orderly transition from local to regional planning without unduly interfering with existing local, long-range plans; and (5) future demands on water and sewer systems (water use and sewage production quantity estimates). (Poertner) W72-05797

STREAMS AND DRAINAGE BASINS, FULTON COUNTY, NEW YORK, Fulton County Planning Dept., Johnstown, N.Y.

For primary bibliographic entry see Field 04A. W72-05798

WATER/SEWER FUNCTION PLAN AND PRO-GRAM-PRELIMINARY.

Central Piedmont Regional Council of Local Government, N.C. For primary bibliographic entry see Field 05D. W72-05799

SASKATCHEWAN'S WATER RESOURCES AND UTILIZATION,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch. For primary bibliographic entry see Field 02E.

### 6E. Water Law and Institutions

WATER POLLUTION CONTROL INSTITU-

Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst. For primary bibliographic entry see Field 05G. W72-05326

MAN AND HIS ENVIRONMENT, VOL. 2. LAW, For primary bibliographic entry see Field 05G. W72-05384

WATER RESOURCES RESEARCH PROJECT: INTRODUCTION,

South Carolina Univ., Columbia. School of Law. C. H. Randall, Jr.

South Carolina Law Review, Vol 23, No 1, p 25-27, 1971. OWRR-B-003-SC (4).

Descriptors: \*South Carolina, \*Water law, \*Legal aspects, Legislation, Water rights, \*Riparian rights, Diversion, Navigable rivers, \*Navigable waters. Surface waters.

A research project into South Carolina water law was supported by the Department of the Interior, Office of Water Resources Research, and the South Carolina Water Resources Research Institute at Clemson University. This project enabled the School of Law of the University of South Carolina to add to its curriculum a seminar on discuss porblems in defining and executing governmental water policy. Others involve problems of interest to the private citizen and his lawyer. (See also W72-05510 thru W72-05514) water law. Some papers submitted in that seminar

WATER RESOURCES RESEARCH PROJECT: NAVIGABILITY - ITS MEANING AND APPLI-CATION IN SOUTH CAROLINA, South Carolina Univ., Columbia. School of Law.

E. W. Wald.

South Carolina Law Review, Vol 23, No 1, p 28-42, 1971. 71 ref. OWRR-B-003-SC (4).

Descriptors: \*South Carolina, \*Navigable waters, \*Federal-state water rights conflicts, \*Tidal waters, \*Ownership of beds, State jurisdiction Water rights, Fresh water, Public rights, United States, Federal government, High water mark, Low water mark, Non-navigable waters, Judicial decisions, Legislation, Streambeds, Riparian rights, Ships, Dams, Obstruction to flow, Tides.

South Carolina case and statutory law is surveyed to define the state's concept of navigability. A brief historical review reveals that the common law recognized public rights in certain waters, the primary right being transportation. The concept of navigability in the United States is reviewed by examining what rights the original sovereign states acquired in navigable waters. The general rule is that the states both own and control navigable waters within their borders, subject always to the superior right of the federal government under the Commerce Clause. The federal test is examined as established by the Daniel Ball, 77 U.S. 557 (1870), under which rivers were navigable in law if navigable in fact. The test depends upon a river's use or susceptibility to use in its ordinary conition as a highway for commerce. Navigability in South ngnway for commerce. Pavigaously in South Carolina is examined with respect to: (1) title to non-tidal stream beds, (2) the statutory right to navigate, and (3) tidal navigable waters. Each area is examined in light of South Carolina's adoparea is examined in light of South Carolina's adop-tion of a minority position recognizing state title only to tidal navigable streams with riparians hold-ing title to all steambeds, navigable and non-navigable, if non-tidal. (See also W72-05509) (Rees-Florida)

A SUMMARY OF MASSACHUSETTS STATE LAWS, POLICIES AND PROGRAMS PERTAIN-ING TO WATER AND RELATED LAND

RESOURCES,
Massachusetts Water Resources Commission,
Boston. Div. of Water Resources.
E. H. Chandler, and C. E. Watson.

1971. 131 P, 2 FIG, 2 MAP, 13 REF, 2 APPEND.

Descriptors: \*Massachusetts, \*Riparian rights, "Water resources development, "Water policy, Legal aspects, Water law, Administration, Ad-ministrative agencies, Economics, Eminent domain, Federal government, State governments, Judicial decisions, Legislation, Permits, Project planning, Water rights, Water allocation (Policy), Planning, Water resources, Water quality control, Regulation, Coordination.

A synopsis is presented of existing Massachusetts law relating to water resources as found in the state constitution, statutes, judicial decisions, and opinions of the state Attorney General. The exist-ing water rights doctrine, the regulatory authority over water quality, and the issuance of permits or approval for specific activities are discussed. The various interstate compacts and commissions in the field of water resources to which the state is a party are enumerated. The authority and duties of state water resources agencies are described in detail. Certain recommendations are made for the centralization of water management functions and centralization of water management nutrions and increased coordination between political units. The existing programs designed for research, planning, drainage, irrigation, construction, and other purposes related to water resource managment are described. An appendix contains an inventory of the existing non-federal projects and of water management problems and their recommended solutions. These problems include the need for: (1) increased water supply, (2) water quality control, (3) flood control, (4) recreation, (5) navigation, and (6) hydro power. (Johnson-Florida) W72-05515

PERMISSION TO FILE CONFERENCE RE-PORT ON H.R. 4148 UNTIL MIDNIGHT WED-

Congressional Record, Vol 116, No 46, p H 2314-2347 (daily ed.) March 24, 1970.

Descriptors: \*Legislation, \*Water quality control, \*Water pollution control, \*Regulation, Adminis-\*Water pollution control, \*Regulation, Adminis-trative agencies, Federal government, Oil wastes, Ships, Navigable waters, Sewage, Sewage disposal, Grants, Contracts, Universities, Standards, Training, Government finance, Mine wastes, Environmental sanitation, Great Lakes, Structures, United States.

Identifiers: \*Water Pollution Control Act, \*Water Quality Improvement Act of 1970, \*Environmental Quality Improvement Act of 1970.

A statement of the conference committee respecting H.R. 4148, a bill amending the Federal Water Pollution Control Act (FWPCA) is reprinted. Title 1, the Water Quality Improvement Act of 1970, would create the following new sections: (1) section 11 - control of pollution by oil; (2) section 12 control of hazardous polluting substances; (3) section 13 control of sewage from vessels; (4) section 14 - mine water pollution control demonstration projects; (5) section 15 - pollution control in the Great Lakes; (6) sections 16-18 - training grants and contracts with undergraduate educational facilities; (7) section 20 - Alaska village demonstration projects; and (8) section 21 - federal agencies' cooperative efforts to effect the purposes of the Act. Title 11, the Environmental Quality Improvement Act of 1970, would establish the Office of Environmental Quality Improvements (Quality Law of Utility and outling its researchibit Environmental Quality and outline its responsibilities. For each of these sections, both the House and Senate bills and the conference substitute are reprinted. Appendix A reprints the Water Pollution Control Act in its entirety, with new sections italicized and existing sections to be omitted bracketed (Rees-Florida) W72-05516

NORTH CAROLINA WATER PLAN PROGRESS REPORT, CHAPTER 1, WATER POLICY AND LAW (DRAFT). North Carolina State Dept. of Water and Air

Resources, Raleigh.

February 1971. 225 p, 205 ref, 2 append.

Descriptors: \*North Carolina, \*Water resources development, \*Water policy, \*Planning, \*Legisla-tion, Water rights, Riparian rights, Navigable waters, Rivers, Surface waters, Groundwater, Cities, Local governments, Water pollution, Water pollution control, Water quality control, Administrative agencies, Regulation, Judicial decisions, Legal aspects, Estuaries, Water wells, Dams.

Existing water policy is explored, statutory and common law rules concerning water rights are described, proposed policies are reviewed, and the state's role in water resources management is considered. A review of constitutional provisions, statutes, judicial decisions, and attorney general's opinions discloses the state's concern with surface waters, groundwater, and pollution. North Carolina has adopted the doctrine of riparian rights toward surface waters and of overlying rights toward groundwater, but selected recent legislation regulates other areas, including: (1) water pollution control, (2) water use, (3) well construction, (4) watershed programs, and (5) estuarine programs. The formulation of a national water policy by five administrative bodies is reviewed. The formulation of North Carolina's water policy is discussed by examining the recommendations by the legislative Research Commission, two inter-agency groups, and a coastal zone study and policy statement by the Board of Water and Air Resources. (Rees-Florida) W72-05517

WISE MANAGEMENT OF NORTH CAROLINA WATER RESOURCES THROUGH LAW-AN ORIENTATION BROCHURE-VOL. 1. North Carolina State Dept. of Water and Air

Resources, Raleigh.

August 1966. 114 p, 2 plate, 2 chart, 53 ref.

Descriptors: \*North Carolina, \*Water management (Applied), \*Water resources development, \*Water allocation (Policy), Water supply, Surface waters, Groundwater, Underground streams, Water wells, Water users, Water utilization, Waste disposal, Water pollution control, Administrative agencies, Data collection, Flood control, Watersheds (Basins), Aquifers.

The basic proposals for water allocation programs are summarized. Chapter one presents a historical review of investigations authorized by state or federal governments and of their findings. The responsibilities and activities of the Department of Water Resources are discussed. The chapter concludes with a review of the powers exercised by several state commissions and boards. Chapter two examines the necessity of additional regulatory powers over withdrawals of ground and surface waters in order to insure protection of existing water supplies. Chapter three examines the poli-

### Field 06-WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

cies of other states with respect to water quantity management. A summary of recent developments in western and eastern states is provided, and a detailed review of selected water allocation programs in Iowa, New Jersey, and Florida is made. The Model Water Use Act is discussed. The chapter concludes with a discussion of diffused surface water legislation and the constitutional problems inherent in any new water laws. Chapter four outlines the possible courses of action to achieve a comprehensive water use regulatory program. (Rees-Florida) W72-05518

INTRODUCTION OF THE NATIONAL MARINE WATERS POLLUTION CONTROL AND QUALI-TY ENHANCEMENT ACT OF 1970,

Washington, D.C.; and Senate, Congress, Washington D.C.

H. A. Williams, Jr.

Congressional Record, Vol 116, No 23, p S2067-2069 (daily ed.) February 20, 1970.

Descriptors: \*Oceans, \*Waste disposal, \*Legislation, \*Pollution abatement, \*Federal government, Political aspects, Regulation, Water pollution, Legal aspects, Administration, Administrative agencies, Financing, Grants, Water pollution control, Water pollution sources, Water pollution effects, Treatment, Sewage sludge, Permits, Standards, Remedies.

Identifiers: \*Water Pollution Control Act.

The dumping of sewage sludge at sea is detrimental to the marine environment and to beach ecology and use. Research indicates that dumping of sludge off New Jersey has formed a dead sea of 15 square miles. To remedy this problem Senator Williams introduced a bill to amend the Federal Water Pollution Control Act. The bill will apply to the discharge of wastes off the coasts of all It would permanently prohibit waste discharges into the waters of the contiguous coastal zone. The bill also prohibits discharges into waters beyond the contiguous zone, except under regulations promulgated by the Secretary of the Interior. Procedures are established for public hearings to promulgate such regulations to insure full consideration of all environmental needs. The continued discharge of wastes pending issuance of permit is allowed only if made at least 100 miles from the United States. Grants to local governments are authorized to cover increased costs incurred for waste treatment and transportation. A monitoring system is provided to insure com-pliance. Civil enforcement penalties are established. Two reports relating to ocean waste disposal are set forth. (Horwitz-Florida) W72-05519

ENVIRONMENTAL QUALITY: THE SECOND ANNUAL REPORT OF THE COUNCIL ON EN-VIRONMENTAL QUALITY, AUGUST 1971. Council on Environmental Quality, Washington,

D.C. For primary bibliographic entry see Field 05G. W72-05520

A BILL TO REGULATE THE DUMPING OF MATERIAL IN THE OCEANS, COASTAL AND OTHER WATERS AND FOR OTHER PUR-POSES.

Washington, D.C.; and Senate, Washington, D.C.

J. C. Boggs.

Congressional Record, Vol 117, No 36, p 3200-3207 (daily ed.) March 16, 1971. 6 ref.

Descriptors: \*Oceans, \*Waste disposal, \*Waste dumps, \*Regulation, Water pollution, Federal government, Jurisdiction, Legislation, Legal aspects, Political aspects, Permits, Standards, Water pollution control, Solid wastes, Sludge, Ultimate disposal, Administration, Administrative agencies, Environmental effects, Public health.

President Nixon's plans for controlling ocean pollution were introduced by Senator Boggs in the Marine Protection Act of 1971. The bill establishes a permit system to prevent or seriously limit the use of the oceans off the United States as sewers. The stated policy is to regulate the dumping of all types of materials in the oceans and to prevent or vigorously limit the dumping of any material which could adversely affect human health, the marine environment, ecological systems, or economic potentialities. All ocean dumping originating from the United States is prohibited unless a permit has been granted by the Administrator of the Environmental Protection Agency. The Administrator shall enforce the act by utilizing appropriate federal agencies. A maximum penalty of \$50,000 is established for dumping without, or in violation of, a permit. The Secretary of State in consultation with the Administrator shall seek international ac-tion to ensure protection of the marine environment. (Horwitz-Florida) W72-05521

OIL AND HAZARDOUS SUBSTANCE POLLU-TION CONTROL ACT OF 1968 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED). House Bill No. 16559, 90th Cong, 2d Sess. (1968).

Descriptors: \*Navigable waters, \*Water pollution control, \*Oceans, \*Oily water, United States, Oil industry, Shores, Offshore platforms, Oil wastes, Remedies, Damages, Regulation, Pollution abatement, Water pollution, Administration, Administrative agencies, Legislation, Legal aspects, Federal government.

Identifiers: \*Water Pollution Control Act, \*Oil

The bill, amending the Federal Water Pollution Control Act, provides for control of oil discharged into the waters of the contiguous zone of the United States and for the removal of discharged matter from the navigable waters of the United States, the contiguous zone, and the high sea. Except in emergencies imperiling life or property, unavoidable accident, or as provided by law, it is unlawful to discharge oil into the Nation's navigable waters or adjoining shorelines, or into waters within the contiguous zone if such oil may pollute the Nation's territorial waters. Violators subject to fine, imprisonment, and civil penalties. Persons authorized by the Secretary of Interior or the Coast Guard may board and inspect any vessel, with or without a warrant, and execute any process issued by a court of competent jurisdiction. A provision for notification in the event of discharge is provided. If a violator fails to act within a reasonable time, however, he shall be additionally liable for the cost of removal, provided the discharge was not due to an act of God. (Shelnut-Florida) W72-05522

BIERMAN V. CONSOL. EDISON CO. OF NEW YORK, INC. (LIABILITY FOR RUPTURED WATER MAIN).

320 N.Y.S.2d 331-333 (App. T. 1970). 3 p.

Descriptors: \*New York, \*Damages, \*Cities, \*Remedies, \*Water conveyance, Power plants, Judicial decisions, Legal aspects, Legislation, Water supply, Water works, Pipes, Distribution, Local

Plaintiff sued defendants, a power company and a city, to recover damages resulting from a ruptured water main. Defendant power company contended that no negligence had been proven and that no liability could be based on strict liability absent an appellate court ruling or a statute. Defendant city contended that there was insufficient proof of negligence to sustain a recovery. On appeal, the New York Supreme Court, appellate term, reversed the judgment against the defendant

power company, but upheld judgment of damages against the city. The court stated that the lower court erred in departing from the traditional rules of negligence and in adopting a rule of strict liability without fault. If a rule of strict liability for damages caused by water mains is to be adopted, the pronouncement must come from the legislaor an appellate court. Strict liability may oe imposed by a court of original jurisdiction. With respect to the claim against defendant city, the court held that proof of a burst water main will permit an inference of negligence sufficient to sustain recovery. (Shelnut-Florida) W72-05523 be imposed by a court of original jurisdiction. With

IMPROVING THE QUALITY OF OUR EN-

VIRONMENT,
Congress, Washington, D.C.; and House,
Washington, D.C. L. H. Hamilton.

Congressional Record, Vol 116, No 42, p H1938-1940 (daily ed.) March 18, 1970.

Descriptors: \*Environmental sanitation, \*Pollution abatement, \*Political aspects, \*Water pollu-tion control, Conservation, Project planning, Environment, Environmental effects, Air pollution, Waste disposal, Legal aspects, Solid wastes, Public health, Water pollution, Water quality control, Financing, Federal government, State governments, Local governments, Jurisdiction, Legislation, Treatment facilities.

Environmental pollution is reaching the point of no return. Water, air, and solid waste pollution are approaching the crisis stage. Every river system in America suffers from some degree of pollution. About 30% of the Nation's water sources and systems fall below federal health standards. Water pollution upsets the delicate processes of nature and poses a direct hazard to human health and welfare. To insure a solution to the environmental problem, the government must bear the major burden. To attain this goal we must do the following: (1) establish a joint congressional committee to oversee the environment, (2) promote environ-mental education, (3) increase funding for pollu-tion control at all levels of government, (4) install a tax system that makes polluters pay the cost of purification, and (5) produce more research and intergovernmental cooperation. (Horwitz-Florida) W72-05524

WELL CONSTRUCTION REGULATION AND STANDARDS.

For primary bibliographic entry see Field 08A. W72-05525

LACHES: WAIVER OR ESTOPPEL ON PART OF GOVERNMENT RESPECTING OBSTRUC-TION TO NAVIGATION.

American Law Reports, Annotated, Vol 2, p 1694-1698, 1919,

Descriptors: \*Water rights, \*Reservation doctrine, \*Navigation, \*Adjudication procedure, \*Obstruction to flow, Water law, Jurisdiction, Federal government, State governments, Political aspects, Public rights, Riparian rights, Navigable waters, Public rights, \*Content of the Content of the C Prescriptive rights, Structures, Ships, Dams, Bridges, Judicial decisions, Legislation, Legal aspects, Local governments.

Identifiers: \*Laches, \*Estoppel, \*Statute of

Laches generally is not imputable to a government, nor may a government be estopped from exercising its sovereign authority. In any suit by the federal or a state government to enforce rights vested in its sovereign capacity, it is not bound by a statute of limitations unless the statute declares otherwise. Consequently, any laches, waiver, or estoppel on the part of a government, respecting an obstruction to navigation, will not as a general rule work a loss of its right to have the obstruction removed. Jucicial decisions from California. Il-

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whic notal ing v Ease are o publi reac revie linois, Kansas, New Hampshire, New York, North Carolina, and the United States federal courts illustrate these conclusions, including situations where: (1) the depositing of saw dust in a navigable river for over 20 years did not prevent the government from abating such a public nuisance; (2) a tunnel constructed beneath the Chicago River pursuant to local ordinance could be removed by the state's exercise of its power to improve navigation; and (3) a bridge lawfully constructed over a river could be removed, for the state's police power could not be contracted away or destroyed by compromise. The rule in Wisconsin permitting obstructions to navigation by legislative permission is also examined. (Rees-Florida)

### TITLE TO BEDS OF NATURAL LAKES OR PONDS.

American Law Reports, Annotated, Vol 23, p 757-799, 1923.

Descriptors: \*Ownership of beds, \*Beds, \*Riparian rights, Lakes, Ponds, Water rights, Public rights, Riparian waters, Riparian lands, State governments, State jurisdiction, Tidal waters, Navigation, Boundaries (Property), Great Lakes, Usufructuary right, Banks, Judicial decisions, Legal aspects, High water mark, Low water mark, Navigable waters, Land tenure.

The common law held waters capable of naviga-tion were navigable, whether tidal or not, and that the sovereign could grant beds of navigable waters into private ownership, subject to public rights such as navigation and fishing. Judicial misin-terpretation of this rule and the observation of other false premises have confused the question of title to beds. The power of states to convey is discussed in relation to application of the public trust theory which erroneously denies private ownership and recognizes the state as holding beds in trust for the public. Other states have reserved title by statutory and constitutional provisions. The Great Lakes, themselves, are generally not susceptible of private ownership, and any grant would confer only usufructuary rights, more like an easement than fee title. Exceptions to this general rule are discussed. Title to the beds of small lakes and ponds passes with a grant of the riparian land, but there are exceptions. Cases holding title in the public for navigable lakes, by observation of the erroneous trust theory, and those cases finding title in private persons are examined. (Rees-Florida) W72-05527

RIGHTS, PRIVILEGES, OR EASEMENTS OF PUBLIC, ITS GRANTEES OR LICENSEES, ON LAND BORDERING ON NAVIGABLE WATER. American Law Reports, Annotated, Vol 53, p 1191-1201, 1928.

Descriptors: \*Navigable waters, \*Riparian rights, \*Public rights, \*Easements, \*Riparian land, Water rights, Prescriptive rights, Eminent domain, Compensation, Right-of-way, Navigation, Streams, River beds, Land tenure, Roads, Legislation, Lumbering, Banks, Judicial decisions, Legal aspects, Permits, Relative rights.

The right of the public, grantees and licensees, to use land adjoining a navigable body of water in which the riparian owner generally has exclusive title and right of possession is discussed in this annotation. Rights, privileges, and easements involving voluntary rather than involuntary uses or encroachments upon riparian land are considered. Easements as a means of access to riparian land are discussed in recognition of the rule that the public has no right to cross private property to reach public bodies of water. Rights exercisable along river banks as an incident of navigation are reviewed through a general examination of judicial decisions which hold any appropriation of banks

to be a taking of private property. Rights exercisable along banks for landing vessels and storing freight are also explored. The only exceptions allowing use of the banks involve situations of emergency, danger, or necessity. Rights along banks also are discussed as an incident to lumbering and specifically for reclaiming lost logs. (Rees-Florida) W72-05528

ENVIRONMENTAL LAW: ECOLOGY HELD VALID CRITERION FOR DENYING DREDGE AND FILL PERMIT UNDER SECTION 10, RIVERS AND HARBORS ACT OF 1899. For primary bibliographic entry see Field 05G. W72-05529

INDUSTRIAL WATER POLLUTION AND THE REFUSE ACT: A SECOND CHANCE FOR WATER QUALITY,
Washington Univ., Seattle. School of Law.

Washington Univ., Seattle. School of Law. For primary bibliographic entry see Field 05G. W72-05530

GUIDELINES FOR PLANNING AND REVIEW OF CHANNEL IMPROVEMENT. For primary bibliographic entry see Field 05G. W72-05531

DREDGING, FILLING AND FLOOD PLAIN REGULATION IN MICHIGAN, Wayne State Univ., Detroit, Mich. R. W. Bartke. Wayne Law Review, Vol 17, No 3, p 861-916, July-August 1971. 240 ref, 1 append.

Descriptors: \*Michigan, \*Dredging, \*Landfills, \*Flood plain zoning, Riparian waters, Riparian rights, Public rights, Navigation, Recreation demand, Structures, Insurance, Lakes, Ownership of beds, Great Lakes, Legislation, Judicial decisions, Legal aspects, Engineering structures, Easements.

Thompson v. Enz was one of the first decisions prohibiting the dredging of canals to provide direct access to natural waterbodies. Subsequent decisions which confuse the Thompson holding are reviewed. Beyond judicial control over dredging, a 1968 amendment to the Inland Lakes and Streams Act (ILSA) requires legislative authorization for dredging. The Act's drawbacks are considered. Landfills into navigable waters, impressed with a public trust held by the state, have been judicially tested and legislatively regulated through ILSA. Decisions indicate the riparian owner bears the burden of proving filling activities do not impair public rights. Filling of nonnavigable waters presents different legal problems since such waters are privately owned with no public right of use. Michigan was the first state to prohibit filling into nonnavigable waters. Michigan House Bill 4948 offers a comprehensive, uniform treatment of dredging and filling through active use of the police power. Problems of flood plain regulation are examined. To minimize flood losses, three approaches are considered: (1) protective engineering works, (2) insurance, and (3) flood plain zoning. (Rees-Florida) W72-05532

STATE HWY. COMM'R.V. RICHMOND, F. AND P.R.R. (RAILROADS'S SUIT TO RECOVER FROM STATE COST OF CONSTRUCTING ADDITIONAL DRAINAGE CULVERTS).
170 S F 24640-643 (Va. 1971) 4 p.

Descriptors: \*Virginia, \*Road construction, \*Railroads, \*Streamflow, Damages, Streams, Storm runoff, Surface drainage, Stream improvement, Peak discharge, Ponding, Watersheds (Basins), Culverts, Drainage systems, Highways, Jucidical decisions, Legal aspects, Riparian rights, Obstruction to flow, Remedies, Governments, State governments, Interstate. Defendant highway commissioner in constructing an interstate highway had improved and relocated two streams whose converging waters flowed under plaintiff's railroad bed through an arch culvert. Plaintiff sought damages in a declaratory action for the construction of additional culverts to accommodate storm runoff upon its property, necessitated by the highway construction. Defendant appealed a circuit court order that defendant compensate plaintiff for 95% of its cost or institute eminent domain proceedings. The Supreme Court of Appeals of Virginia reversed, holding: (1) defendant had not caused plaintiff's damages since plaintiff's culvert was wholly inadequate to carry off storm runoff prior to the highway construction that increased the peak stream discharge; (2) the state constitution did not provide a remedy in every case for all damages to private property for public uses; and (3) a lower riparian owner, such as plaintiff, may not so obstruct a natural water-course as to cause surface waters to inundate the lands of upper owners whether resulting from usual or unusual rainfall that could be anticipated. (Rees-Florida)

SHERIDAN DRIVE ASS'N V. WODDLAWN BACKPROPERTY OWNERS ASS'N (OWNERS ADJACENT TO ROAD HAVE EXCLUSIVE RIPARIAN RIGHTS IN SHORE AND LAKE OP-POSITE PROPERTY). 185 N.W.2d 107-110 (Ct. App. Mich. 1970). 4 p.

Descriptors: \*Michigan, Riparian rights, \*Competing uses, \*Lake shores, Water law, Water rights, Legal aspects, Lakes, Riparian waters, Riparian land, Recreation, Recreational facilities, Reasonable use, Relative rights, Public rights, Remedies, Judicial decisions, Roads, Watercourses (Legal).

Plaintiffs owned lots fronting on Sheridan Drive. Claiming exclusive riparian rights in a lake across the road and immediately opposite their lots, plaintiffs sought to enjoin defendants, whose lots were not adjacent to this Drive, from trespassing and usurping their riparian rights. Defendants contended that a prior adjudication was res judicata to the parties and issues at bar. The decision referred to had adjudicated the rights of owners of property in Woodlawn Subdivision to use Sheridan Drive. It had not determined plaintiff's riparian rights. The Court of Appeals of Michigan affirmed the trial court's finding that: (1) there was no intervening land between the easterly border of Sheridan Drive and the lake, and the owner of land separated from a lake by a public road has riparian rights in the lake; and (2) the owners of noncontiguous property and the public generally were entitled to access to the lake at such points where the lake served as a terminus of streets intersecting the road at right angles. (Rees-Florida)

BUTLER V. STATE (RIPARIAN'S RIGHT TO ISLAND OWNERSHIP). 244 So.2d 888-894 (Ct. App. La. 1971). 7 p.

Descriptors: \*Louisiana, \*Mississippi River, \*Ownership of beds, \*Accretion (Legal aspects), \*Islands, Riparian rights, Navigable rivers, Water law, Land forming, Stream flow, Routing, Chaneling, Meanders, Scour, Topography, Hydrography, Geomorphology, Contours, Surveys, Mapping, Measurements, Legislation.

Plaintiff riparian landowners brought suit against defendant state seeking to be declared owners of an island located in the Mississippi River west of plaintiffs' property. Expert testimony and documentary evidence, principally a hydrographic and topographic survey and a shoreline survey, indicated the island had not been formed from the riverbed. Plaintiff's evidence established that accretion along the bank, followed by scouring and channeling, formed the island. The Court of Appeal of Louisiana, First District, reversing the trial court, held that the island once was part of the existing riverbank and had been divided from it by

### Field 06—WATER RESOURCES PLANNING

### Group 6E-Water Law and Institutions

the River's opening a new branch; therefore the the kiver's opening a new branch; therefore the island remained the property of plaintiffs. The court refused defendant's contention that the word towhead was generically significant to imply formation from the riverbed and not from the riverbank. (Rees-Florida)
W72-05537

WATRING V. UNNAMED INBOARD MOTOR BOAT NO. WV4488AB (JURISDICTION OF FEDERAL COURT DETERMINED BY NAVIGA-BILITY OF RIVER). 322 F. Supp. 1226-1229 (S.D.W.Va. 1971). 4 p.

Descriptors: \*Navigable rivers, \*Lakes, \*Dams, \*Federal jurisdiction, Reservoirs, Accidents, Boats, Shoals, Sand bars, Legal aspects, Judicial decisions, Navigability, Jurisdiction.

Plaintiff boating accident victim sought to invoke federal admiralty jurisdiction against defendant boatowner. The accident occurred in a lake formed by damming a river. Jurisdiction was sought under 28 U.S.C. sec. 1333: 'district courts shall have original jurisdiction...of: (1) Any civil case of admiralty or maritime jurisdiction...' Jurisdiction existed if the lake or river could be considered navigable waters of the United States. The Federal District Court stated that rivers navigable in law are those navigable in fact. Furthermore, it observed that the dam would not inhibit an otherwise navigable river. The court also stated, however, that exceptional use for commerce under exceptional conditions will not create navigability. Plaintiff attempted to sustain his burden of proving navigability by introducing old geological surveys and a book entitled 'Tales of the Elk.' Since the judge was personally familiar with the Elk River, and stated that it was a succession of shoals, rapids, and sandbars, the court held that neither the Elk River nor the reservoir was navigable. Therefore plaintiff's action was dismissed. (Hart-Florida)

HOTARD V. PERRILLOUX (DRAINAGE DISPUTE BETWEEN ADJACENT LAN-ADJACENT 8 La. App. 476-478 (1928).

Descriptors: \*Louisiana, \*Drainage, \*Easements, \*Surface runoff, Water law, Drainage water, Riddance (Legal aspects), Surface waters, Rela-

Plaintiff landowners sued defendant landowner to enforce rights of drainage. In prior litigation, plain-tiffs' right to drain their property upon defendant's land had been established. Defendant now resisted the prior judgment, contending that plaintiffs' attorney had agreed to substitute another drainage location and that he had a right to change the location of the existing drainage servitude. Plaintiffs, however, later retained another attorney who repudiated the unwritten agreement with defendant. Since the agreement was unwritten, the Louisiana court of appeals refused to enforce it. Although the Louisiana Code provided for a changed location when an equally convenient drainage location was offered, and the present location was unduly burdensome, the court stated that if the servitude holder refused to agree to the change, the parties rights must be determined in court. Defendant was enjoined from interfering with the servitude in its present location. (Hart-Florida)

VIDRINE V. GUILLORY (LIABILITY OF LAN-DOWNER FOR OBSTRUCTING NATURAL DRAINAGE). 3 La. App. 462-464 (1925).

Descriptors: \*Louisiana, \*Drainage, \*Levees, \*Adjudication procedure, Legal aspects, Judicial decisions, Real property, Relative rights.

Plaintiff landowners sued defendant, adjacent landowner, seeking damages and an injunction to abate a drainage obstruction. Plaintiffs' tracts drained through defendant's tract, and defendant drained through detendant's tract, and detendant erected levees which obstructed plaintiffs' natural drainage. Defendant contended that he had removed a portion of his levees as a result of a compromise agreement with plaintiffs. Plaintiffs denied the existence of such an agreement. denied the existence of such an agreement. Although the disputed agreement was unwritten, the lower court permitted testimony concerning it. Since the agreement was unwritten, the Louisiana court of appeals held that the testimony was inadmissible. A mandatory injunction, requiring defendant to remove the levees, was issued because under the Louisiana Code one can compel the removal of artificial obstructions to drainage. (Hart-Florida) (Hart-Florida)

JACKSON V. WALTON (INJUNCTION TO PREVENT USE OF WATER ON NON-RIPAR-IAN LAND). 2 La. App. 53-56 (1925).

Descriptors: \*Louisiana, \*Riparian rights, \*Irriga-tion, \*Riparian water loss, \*Damages, Contracts, Riparian waters, Irrigation water, Competing uses, Riparian land, Legal aspects, Judicial decisions. Identifiers: Injunctions (Prohibitory).

Plaintiff riparian owner sought an injunction to prevent defendant non-riparian owner from pump-ing water from a bayou. Defendant contracted with plaintiff's neighbor to pump water from the bayou to use on defendant's non-riparian land for irrigation and the washing of a dairy barn. Plaintiff alleged the value of his land was diminished by the contract, and that it might impair fishing. Plaintiff, however, contemplated no use of the water himself. No showing of the quantity of water defendant intended to take was made. Since plaintiff did not show any actual or impending danger beyond a mere apprehension of possible harm, the Loui-siana court of appeals dissolved the injunction, issued by the lower court, with leave to review if plaintiff could show actual or imminent harm. (Hart-Florida) W72-05541

GREEN V. CITY OF ROCK HILL (INJUNCTION TO PROHIBIT CITY FROM ENGAGING IN MUTUALLY BENEFICIAL WATER SUPPLY CONTRACT WITH PRINTING COMPANY.

147 S.E. 346-361 (S.C. 1929).

Descriptors: \*South Carolina, \*Water supply, \*Financing, \*Contracts, Taxes, Government finance, Supply contracts, Leases, Cities, Water management (Applied), Legal aspects, Judicial decisions, Public benefits, Utilities, Water allocations, Public benefits, Utilities, Water allocations, Public Benefits, Utilities, Water Management

Plaintiff municipal taxpayers sought to enjoin defendant city from contracting with defendant printing company to construct an additional water printing company to construct an additional water supply system to be managed and operated by the company, and to prohibit the city from issuing bonds to construct the system. The company would furnish the city a quantity of water, and use the remainder for its own purposes. Plaintiff con-tended that: (1) the contract was ultra vires, (2) defendant's taxing power was used for a private pur-pose, (3) the fiduciary obligation of the city was pose, (3) the fucuciary obnigation of the City was violated, (4) legislative authority for the contract was necessary, (5) the city illegally delegated its fiduciary and discretionary powers, and (6) the bonds were an illegal borrowing for a private purpose. The South Carolina Supreme Court determined to the contract of the court of the cour mined that legislation retroactively permitted the council to make the contract. The court further reasoned the contract was primarily for public purposes. Plaintiff's other contentions were also rejected by the court, which upheld the contract. Since the project was primarily for public pur-poses, the bonds were determined to be a permissible exercise of defendant city's borrowing power. Hence the injunction sought by plaintiff was denied. (Hart-Florida) W72-05542

PEACOCK V. CITY OF GREENSBORO (DAMAGES FOR PONDING CAUSED BY CITY 196 N.C. 412, 146 S.E. 3-5 (1928).

Descriptors: \*North Carolina, \*Cities, \*Ponding, \*Damages, Dams, Drainage, Flooding, Flood damages, Legal aspects, Judicial decisions, Legislation, Remedies.

Plaintiff riparian landowner sought to recover damages from defendant city for injury to his land caused by ponding. Plaintiff's land abutted on a stream which defendant used for its water supply. Defendant dammed the stream to increase the supply of water. The municipal charter consented to suit only when notice of the injury was given within six months. Defendant first asserted that plaintiff had failed to provide proper notice, but the North Carolina Supreme Court held the notice given by plaintiff satisfied the statutory require-ment. Defendant also asserted that plaintiff was only entitled to temporary damages, but the jury only entitled to temporary damages, but the jury verdict did not state whether the award was for permanent or temporary damages. The court determined that if plaintiff was entitled to permanent damages, the jury instructions were erroneous; conversely, if defendant was entitled to temporary damages, the trial court erred in admitting certain evidence. Since there had been no permanent appropriation of plaintiff's land, but only a temporary trespass by ponding, the court held that plaintiff was only entitled to temporary damages, and ordered a new trial. (Hart-Florida) W72-05543

BOHRER V. VILLAGE OF INVER GROVE (DAMAGES TO ADJACENT LAND CAUSED BY FILLING IN RAVINE). 207 N.W. 721-722 (Minn. 1926).

Descriptors: \*Minnesota, \*Water courses (Legal), \*Surface runoff, \*Surface waters, Surface drainage, Cities, Rainfall, Ravines, Damages, Land, Land tenure, Judicial decisions, Legal aspects, Outlets, Remedies, Rainwater, Sedimen-

Plaintiff sought to recover damages to his property from defendant village and school district. The damage was caused by the deposit of sand and dirt on plaintiff's land coming from a natural ravine located on the school district's property. Defendant had deposited the dirt and sand in the ravine when constructing a school. Heavy rainfall washed the material onto plaintiff's land and caused the damage. At trial, the judge instructed the jury that plaintiff could not recover unless defendants must have known that the inevitable and unavoidable result of depositing the sand and dirt would be to carry it onto plaintiff's land. The Supreme Court of Minnesota affirmed the verdict and judgement for plaintiff. If the necessary result of the filling in of the natural water course was to or the filling in of the natural water course was to carry the sand and dirt onto the plaintiff's land the right of recovery was clear. The evidence was suf-ficient to justify a finding that defendants knew such would be a necessary result. (Duss-Florida)

BUERKEL V. CITY OF BOSTON (MUNICIPAL LIABILITY FOR OBSTRUCTED STORM

286 Mass. 412, 190 N.E. 788-789 (1934).

Descriptors: \*Massachusetts, \*Cities, \*Surface runoff, Storm drains, Damages, Flood damages, Storm runoff, Cloudbursts, Surface drainage, Drainage systems, Culverts, Conduits, Pipes, Waste water (Drainage), Legislation, Statutes, Or-dinances, Public utilities.

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Plaintiff property owners sought damages against defendant city for the negligent maintenance of storm drains and catch basins, which became obstructed and cused flooding of plaintiffs' stores. Defendant contended that it had sufficiently proven the contributory negligence of plaintiffs, thus barring their recovery. The evidence showed the city's storm basins, located in a public alley, were obstructed with debris from unusally heavy rains, and that defendant was aware of their condition. The Supreme Judicial Court of Massachusetts overruled plaintiffs' exceptions upon finding: (1) the drains were constructed by order of the city street commissioner to carry surface runoff; (2) a state statute provided abutting landowners must hook up to separate sewer mains when requested by a city officer; (3) the plaintiffs never made such connection nor were they required to do so by the city; and (4) in the absence of a statute a municipality is not required to restrain the passage of surface waters from its streets over lands of abutting landowners. (Rees-Florida)

UNDERWOOD V. FAIRBANKS, MORSE AND CO. (MUNICIPAL CORPORATION'S POWER TO CONTACT TO REPLACE EQUIPMENT IN PUBLIC UTILITIES WITHOUT NOTICE OR RIDDING).

185 N.E. 118-124 (Ind. 1933).

Descriptors: \*Indiana, \*Public utilities, \*Contracts, \*Cities, Legal aspects, Electricity, Water works, Electric powerplants, Public works, Electric power, Equipment, Pumps, Electric generators, Appliances, Installation, Facilities, Bids, Supply contracts, Taxes, Cost repayment, Legislation, Judicial decisions. Identifiers: \*Public purposes.

Plaintiffs sought to set aside a contract for the purchase and installation of new equipment in an existing light and water plant made between defendant and a municipality. Contract payment could only come from the plant's net revenues; there was to be no payment from appellee's general funds. Appellants contended that the indebtedness was unconstitutional and that the contract was void due to no notice and no advertising for bids. Plaintiff also alleged a failure to comply with regu-lations of the Public Service Commission. The Indiana Supreme Court held that defendant had an implied, inherent, and statutory power to contract to provide light and water. Since the pledge orders were payable from a special obligation, th tract was not a mortgage upon the plant. Unless restricted by law and in the absence of fraud or abuse of discretion, defendant could contract in its discretion without providing notice or competitive bidding. The court also held that the contract was evidence of indebtedness required by statute to be submitted to the Public Service Commission for prior approval, because the contract did not encumber the plant within the statutory definition. (Rees-Florida) W72-05546

ARICK V. CITY OF WORCESTER (EVIDENCE OF NEGLIGENT MAINTENANCE OF STORM SEWERS BY MUNICIPALITY).

273 Mass. 134, 173 N.E. 417 (1930).

Descriptors: \*Massachusetts, \*Storm drains, \*Storm runoff, \*Flood damage, Cities, Sewers, Judicial decisions, Legal aspects, Surface runoff, Storms, Floods, Cloudbursts, Surface waters, Surface drainage, Rain water.

Plaintiff merchant sued defendant city for flood damage to merchandise in plaintiff's store. Plaintiff alleged that two catch basins directly in front of his store were clogged because of defendant's negligence in their maintenance, and that during a violent rainstorm surface water therefore collected and flooded plaintiff's store. Plaintiff conceded that defendant was not liable, under Massachusetts law, for any defect or inadequacy in design of the storm sewers. Defendant contended that the evidence did not warrant a finding that it was negligent. In affirming a directed verdict for defendant, the Supreme Judicial Court of Massachusetts held evidence that the catch basins did not properly receive water on the day of the flood damage was not admissible in proof of defendant's negligent maintenance as distinguished from improper design of the catch basins. As there was no other evidence of negligent maintenance, the defendant city was not liable for the damages. (Madsen-Florida)

CONSOLIDATED SAFETY PIN CO. V. TOWN OF MONTCLAIR (TOWN'S RIGHT TO DRAIN SURFACE WATER NOT LOST BY DIVERTING WATER FROM ITS NATURAL DRAINAGE COURSE).

139 A. 909 (Ct. Ch. N.J. 1928).

Descriptors: \*New Jersey, \*Storm drains, \*Drainage practices, \*Diversion, Cities, Storm runoff, Surface water, Surface drainage, Surface runoff, Floods, Flood damage, Drainage, Drainage systems, Drainage water, Alteration of flow, Streamflow, Judicial decisions, Legal aspects.

Plaintiff manufacturer sought to enjoin defendant municipality from causing surface water from a storm drain to be deposited in a brook flowing near plaintiff's factory. All other surface water within defendant's limits followed a natural drainage course into the brook. A small portion of the surface water had been diverted by private developers and drained into another watercourse. The storm drain in question reverted that portion to its natural course into the brook. Plaintiff contended that defendant was estopped from reverting the water to its natural course, because defendant had acquiesced in the actions of the developers. Plaintiff also alleged that it had acquired a prescriptive right to have the water diverted. Defendant argued that the amount of water involved was de minimus, and that the importance of defendant's drainage system out-weighed the slight flood damage to plaintiff. The Court of Chancery of New Jersey held defendant was not estopped from reverting the surface water to its natural drainage course, because plaintiff had not acted in reliance upon the diversion. The court also held that plaintiff had acquired no prescriptive right. Although dismissing plaintiff's suit, the court also rejected defendant's conten-tion. (Madsen-Florida)

MURRAY RUBBER CO. V. CITY OF TRENTON (MUNICIPALITY'S LIABILITY FOR OBSTRUC-TION OF FLOW IN WATERCOURSE AND DIVERSION OF SURFACE WATER). 135 A. 475 (N.J. 1926).

Descriptors: \*New Jersey, \*Obstruction to flow, \*Bridge design, \*Storm drains, Cities, Judicial decisions, Legal aspects, Storm runoff, River flow, Barriers, Water control, Bridges, Surface waters, Surface runoff, Surface drainage.

Plaintiff rubber company sued defendant city and defendant Mercer County for flood damage to plaintiff's land. Plaintiff alleged that each defendant neglected its duty to remove artificial obstructions from a creek, and to prevent diversion of surface water from streets. The Supreme Court of New Jersey held these allegations not to state a cause of action. Defendant's jurisdiction and control over the creek established no duty to enter it and remove obstructions, where no such duty existed at common law, the court stated. Furthermore, the court said that a municipality was not liable for 'mere neglect of duty' unless such liablity had been created by the legislature. The complaint further alleged affirmative acts of wrongdoing in defendants' construction of storm sewers empty-

ing into the creek and increasing its flow. The court held plaintiff entitled to no relief on these allegations, citing prior New Jersey decisions. Finally, plaintiff alleged that defendant county negligently constructed and maintained certain bridges across the creek, impeding the flow of water. The court held this allegation to state a cause of action, and remanded the case for trial against the county alone. (Madsen-Florida) W72-05549

JENKINS V. SADLER (OWNERSHIP OF ISLAND IN RIVER).
212 Ky. 581, 279 S.W. 982-983 (Ct. App. Ky. 1926).

Descriptors: \*Kentucky, \*Rivers, \*Boundary disputes, \*Meanders, Boundaries (Property), Thalweg, Islands, Land tenure, Real property.

Plaintiff island owner sought to enjoin defendant landowner from trespassing on his island. Defendant also asserted ownership of the island. Both claimed under patents from the state. The course of the river had changed, and the disputed island lay between the old and new channels. Plaintiff's description indicated his boundary was along the meander of the river. The description also read crossing the river to two beech trees. These trees were still standing. The lower court held that the meanders of the river controlled the property line, rather than the beech trees. The Court of Appeals of Kentucky, however, stated that its object was a determination of the intent of the parties to the description, and determined that although the channel of the river locates the river as a matter of law, nevertheless the river may shift. The two beeches were found to have stood on the original channel of the river, and the court held that they controlled the boundaries of the land. This being the case, there was no conflict between the patents, and judgment was given for defendant. (Hart-Florida) W72-05550

CITY OF PRESTONBURG V. MELLON (CITY'S LIABILITY FOR DAMAGES DUE TO OVER-FLOW FROM PRIVATE DRAINTILE). 220 Ky. 808, 295 S.W. 1064-1066 (1927).

Descriptors: \*Kentucky, \*Cities, \*Overflow, \*Tiles, Drains, Culverts, Surface runoff, Surface waters, Drainage, Land, Land tenure, Sewers, Floods, Flood damage, Remedies, Damages, Legal aspects, Judicial decisions, Adjudication procedure.

Plaintiff landowners sought to recover damages to their property resulting from the overflow of a draintile above their property which was insufficient to carry surface water to a nearby culvert. Plaintiffs initially named the city, the private landowner who had constructed the draintile, and a third party as defendants. They were required by the trial court to elect an individual defendant and they chose the city. Plaintiffs received a verdict, but the Court of Appeals of Kentucky reversed and remanded. Plaintiffs could recover from the city only if it negligently constructed the draintile, negligently authorized construction, or adopted it hereafter as a part of its sewerage system. It could not be held liable for the private acts of one of its citizens. There was no evidence at the trial that dendant had any role in the construction of the draintile. If, at another trial there is no competent evidence showing the city responsible for the draintile, it should receive a directed verdict. (Duss-Florida) W72-05551

AYCOCK V. CITY OF DECATUR (CITY'S LIA-BILITY FOR FLOODING OF WAREHOUSE). 122 So. 664-667 (Ala. 1929).

Descriptors: \*Alabama, \*Flood damage, \*Surface waters, \*Cities, \*Adjudication procedure, Storm drainage, Sewers, Surface runoff, Roads, Ur-

### Field 06—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

banization, Floods, Rain, Rainfall, Legal aspects,

Plaintiff warehouse owner sought to recover damages from defendant city for flooding of his warehouse. Defendant surfaced the streets adjacent to plaintiff's building, and following a heavy rainfall, water flowed along the streets and into the warehouse. Plaintiff's stock was destroyed. Plaintiff asserted that defendant had diverted the natural drainage of surface waters and negligently failed to maintain an adequate sewer system. Defendant contended that it was not liable because plaintiff's negligence in leaving his stock exposed to the potential flood contributed to the injury. The Supreme Court of Alabama held that defendant was not liable for diversion of surface water unless it negligently allowed the water to flow in an artificial channel. The count of the complaint alleging negligent maintenance of a sewer system was held to state a cause of action, but the count alleging failure to maintain a sufficient sewer did not state a cause, because plaintiff did not allege that defendant maintained any sewer. Since plaintiff was entitled to make the most profitable use of his property, defendant's assertion of contributory negligence was rejected by the court. (Hart-Florida) W72-05552

CLEVELAND AND P.R. CO. V. PITTSBURGH COAL CO. (ABILITY OF RIVERBED OWNER TO PREVENT DREDGING UNDER FEDERAL PERMIT).

176 A. 7-10 (Pa. 1935).

Descriptors: \*Pennsylvania, \*Dredging, \*Owner-ship of beds, \*Navigation, Federal government, Administrative agencies, Permits, Real property, Riverbeds, Beds, Beds under water, Land tenure, Easements, Rivers, Streams, Navigable rivers, Docks, Coal, Barges, Legal aspects, Judicial deci-

Plaintiff riverbed owner sought to enjoin defendant coal company from dredging out the riverbed. Defendant used the river to transport its coal in barges; however, the river's depth only permitted the barges to be half-loaded. Defendant applied to the War Department for a permit to dredge the stream to remove collected silt and gravel. The permit was granted. Plaintiff contended that the dredging was a continuing trespass upon his fee in the riverbed. Defendant asserted that since the river was navigable, plaintiff's land was subject to the public navigation servitude. Observing that a river is navigable at law when navigable in fact, the court held that defendant's use of the river for coal transport established its navigability. Determining that defendant, in dredging a navigable stream under federal permit, was exercising a federal power, to which plaintiff's property was subject, the court held that plaintiff was not enti-tled to enjoin the dredging. (Hart-Florida) W72-05553

WYCKOFF TP. V. HAMILTON (REVIEW OF DECISION GRANTING PERMIT FOR MU-NICIPAL WELL). 165 A. 75-76 (N.J. 1933).

Descriptors: \*New Jersey, \*Cities, \*Diversion, \*Water supply, Relative rights, Water allocation (Policy), Administrative agencies, Administrative decisions, Decision making, Water resources development, Adjudication procedure, Legal aspects, Judicial decisions, Wells, Deep wells, Well permits, Permits, Water conservation, Drawdews

Plaintiff township brought certiorari to review derelation to review de-fendant state commission's decision to grant an adjacent township's application to divert I million gal/day of water by well. Plaintiff contended that the evidence disclosed no public necessity for the additional diversion. Plaintiff also contended that the planned wells would impair plaintiff's water

supply. Reviewing the evidence, the court noted that defendant's conclusions could not be overturned if supported by the evidence. Having determined that the conclusion was amply supported, the court concluded that nothing indicated that the additional diversion would impair plaintiff's supply and dismissed the writ. The contemplated wells were deep and were predicted as having little or no effect upon wells in higher strata. (Hart-Florida) W72-05554

ENVIRONMENTAL POLICY AND INTERNA-TIONAL INSTITUTIONAL ARRANGEMENTS: A PROPOSAL FOR REGIONAL AND GLOBAL ENVIRONMENTAL PROTECTION AGENCIES, New Mexico Univ., Albuquerque. School of Law. For primary bibliographic entry see Field 06B. W72-05561

GAO LOOKS AT THE WATER POLLUTION

General Accounting Office, Washington, D.C. E. A. Densmore, Jr., N. Carbone, C. L. Kuchinski, and J. S. Cohen.

General Accounting Office Review, p 3-13, Summer 1970. 1 ref.

Descriptors: Water pollution sources, \*Water pollution treatment, \*Pollution abatement, \*Water pollution control, Waste treatment, Administration, Planning, State governments, Federal government, Benefits, Systems analysis, Construction, \*Treatment facilities.

Identifiers: \*General Accounting Office (GAO), \*Federal construction grant program, Implementa-tion, Federal Water Quality Administration (FW-

Some important aspects of the General Accounting Office's (GAO) review of the Federal construction grant program for abating, controlling, and preventing water pollution are described. The article is a short review of the GAO report sent by the Comptroller General to the Congress in November 1969. Some of the more significant findings and conclusions included: (1) many of the municipal waste treatment facilities have been constructed on waterways where major polluters nearby continued to discharge untreated or inadequately treated wastes into the waterway; (2) the construction grant program has been administered with a shot gun approach, giving little consideration to the immediate benefits to be obtained by the construction of specific treatment plants; (3) due to Federal funding in amounts significantly less than amounts authorized, construcntiticativy less than amounts authorized, construc-tion is proceeding at a low rate; and (4) more con-sideration could be given to planning and imple-menting water pollution control programs on a river-basin basis or to administering the construction grant program through a State agency which would be responsible for the planning, designing, constructing, operating, and maintaining of all waste treatment facilities within the State, GAO further recommended that: (1) The Secretary of the Interior require that the States and Federal Water Quality Administration (FWQA) consider the benefits to be derived from the construction of the facilities and the actions taken or planned by other polluters of the waterways, and (2) that FWQA consider utilizing systems analysis techniques in the planning for and implementing of water pollution control programs. (Strachan-Chicago) W72-05567

THE COORDINATION OF LEGISLATIVE POL-ICY AND THE REGULATION OF PRIVATE IN-TERESTS: SOME SUGGESTED PRAGMATIC PRINCIPLES FOR ENVIRONMENTAL POL-

International Union for the Conservation of Nature and Natural Resources, Bonn (West Ger-

W. E. Burhenne, and W. A. Irwin.

Natural Resources Journal, Vol 11, No 3, July 1971, p 455-465. 17 ref.

Descriptors: \*Environment, \*Environmental effects, \*Legislation, Administration, Planning, Legal aspects, Financing.
Identifiers: \*Environmental policy, \*Legislative

policy, \*Public participation, Insurance, Private land ownership, Public finance policies.

Principles to be kept in mind in formulating environmental policies are proposed. The first category is concerned with the regulation of private interests and includes: (a) objectively reviewing governmental and commercial projects, processes and products for environmental effects; (b) requiring compulsory insurance for unusually dangerous enterprises; (c) implementing the principle that he who generates wastes should pay for disposing of them; and (d) redefining the scope of private land ownership rights. The second category involves the coordination of legislative police (a) utilizing both sugarbread and the whip; (b) avoiding public finance policies with negative environmental side-effects; (c) setting flexible legal standards to be administered according to the state of the art; and (d) working toward the equalization of burdens on industry in all countries. The final category is concerned with participation of the public: (a) expanding the citizens' role in public planning and (b) exerting public pressure for adequate funding and enforcement. (Davis-Chicago) W72-05569

WATER RIGHTS AND WRONGS,

Arizona State Univ., Tempe. Dept. of Economics. D. L. Shapiro.

The Annals of Regional Science, Vol 3, No 2, p 139-147, 1969, 14 ref.

Descriptors: \*Water rights, \*Water allocation (Policy), \*Water law, \*Water transfer, \*Costs, Planning, Economics, Legal aspects. Identifiers: \*Water wrongs, \*Policy making, \*Transaction costs, Sacramento Diverters Con-

troversy, Legal solutions, Land transfer, Automo-

Water law contributes to the water allocation problem. The misallocation of water results from the lack of a market in water rights, and the water laws have prevented such a market from develop-ing. Without a market, water rights cannot be bought and sold, and water therefore does not reach its most valuable use. Consequently, any established allocational pattern is perpetuated. The rights in water are so poorly defined that it is nearly impossible to transfer a right from one owner to another. Although such complicated transfer problems with land and automobiles have been resolved, the transfer of water rights continues to experience intractable difficulties. The contention that law could also reduce transaction costs for water if the law were left to run its course is illustrated by an actual legal-economic con-troversy, i.e., the Sacramento Diverters Controversy. Legal solutions are explored on the basis of transfer problems in automobiles and land. One proposal involves a statute which would have a state issue a certificate of title to every owner of water. An arbitration board would adjudicate conflicting and overlapping claims. A second proposal ricting and overlapping claims. A second proposal would accept the existing system of titles to water rights which would be insured by a government-chartered corporation. Any persons, irrigation districts, or government agencies seeking to purchase water rights could have those rights insured for a few of the country of fee. (Strachan-Chicago) W72-05570

ECONOMICS AND FEDERAL WATER PRO-

JECTS, Arizona State Univ., Tempe. Dept. of Economics. For primary bibliographic entry see Field 06B. W72-05572

INTERN. MANAG Internation Washing Thomas Natural 1 1971, p 50

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Washington, D.C.
Thomas W. Wilson.
Natural Resources Journal, Vol 11, No 3, July

1971, p 507-512. 1 ref.

Descriptors: "Management, "Environment, "In-stitutions, "Institutional constraints, Priorities, Air pollution, Political aspects, Social aspects, Social change, Decision making, International commis-sions, Social values.

Identifiers: \*International environmental management, Environmental crisis, Atmospheric pollu-tion, Oceanic pollution, Social reform, Task force

approach, Information systems.

The need for international institutions to deal with environmental problems is emphasized. There is no possibility that the environmental issue will go away. Some aspects of the environmental crisis (atmospheric and oceanic pollution) are so inherently global that the option for national action does not realistically exist. Concern for environ-mental quality has powerful public support. The environmental issue almost certainly is going to prove to be a powerful instrument for social reform from the recasting of values and priorities to the redesign or mechanisms for decision making. In the long run six likely trends for institutional arrangements on environmental questions can be seen. The traditional institutional boundanes between governmental and non-governmental, physical and social sciences, profession, technical, legal, academic, and public interest organizatons will be criss-crossed and blurred if not eliminated. New institutions will tend to take the form of 'centers' serving as hubs for 'networks' of institutional constituents. International organiza-tions for environmental tasks will move in the direction of the 'task force' approach. Information systems will tend to be near the functional heart of environmental institutions. There will be a trend toward new and/or adapted international regional organizations less along the lines of regions defined by present political groupings and more along the lines of environmentally related regions. The permanent bureaucracies within international environmental organizations will tend to be the minimum required for administrative continuity; the bulk of professional personnel will serve for relatively short periods of time. (Davis-Chicago) W72-05578

LOSS LEVELS, United States Lake Survey, Detroit, Mich. B. G. DeCooke. Water Spectrum, Vol. 3, No. 4, p 30-36, Winter 1971-72. 7 photo, 3 fig.

Descriptors: \*Great Lakes, \*Fluctuation, \*Riparian waters, \*Navigation, \*Power operation and maintenance, \*Hydraulic systems, Federal government, Water users, Regulation, Lake Superior, Lake Ontario, Planning. Identifiers: \*Loss levels, \*Level variation problem, Canadian government, Interest areas.

Three general interest areas are affected by fluctuating lake levels: riparian, navigation, and power interests. The Great Lakes are discussed in detail in terms of a huge hydraulic system. Riparian interests include port facilities, marinas, industry, municipal works, recreational developments, fish and wildlife habitat, and home and cottage industries. Navigation interests include commercial deep-draft traffic and recreational boating. Power interests are those which generate power from the outflows from the lakes. Past actions taken by the outliows from the lakes. Past actions taken by the United States and Canadian governments to meet the demands of the various users of the Great Lakes waters include: improvements in the navigation channels, regulation of the Lakes Su-perior and Ontario, diversions of water into and out of the system, and the installation and removal of Gut Dam in the St. Lawrence River. Possible solutions to the level variation problem include: (1)

regulation of Lake Superior to offset extreme conditions downstream, and (2) the interjection of water into the lakes from outside the Great Lakes basin. If further changes are to be made to the water-level range, the solution will have to be a compromise between the various concerned interests. (Strachan-Chicago)

THE SPLENDID BUT SUPERFICIAL CON-TRIBUTION OF CONVENTIONAL ECONOMIC ANALYSIS TO THE MANAGEMENT

PUBLIC RESOURCES,
Economic Research Service, Fort Collins, Colo.; and Bureau of Land Management, Denver, Colo. For primary bibliographic entry see Field 06B.
W72-05582

PRINCIPLES AND STANDARDS FOR PLANNING WATER AND RELATED LAND RESOURCES: A REVIEW AND EVALUATION, Economic Research Service, Washington, D.C. Natural Resources Economics Div. For primary bibliographic entry see Field 06B. W72-05675

THE ROLE OF LITIGATION IN ENVIRON-MENTAL POLICY: THE POWER PLANT SIT-ING PROBLEM,

Winer, Neuburger, and Sive, New York. For primary bibliographic entry see Field 05G. W72-05690

THE BUREAUCRATIC RESPONSE TO EN-VIRONMENTAL POLITICS,

California Univ., Davis. Geoffrey Wandesforde-Smith. Natural Resources Journal, Vol. 11, No. 3, July 1971, p 479-488, 34 ref.

Descriptors: \*Political aspects, \*Environment, \*Resource allocation, \*Decision making, Resources, Administration, Governments, \*Resource allocation, \*Decision making, Resources, Administration, Governments, Resource development, Political constraints, Planning, Legal aspects, Values.

Identifiers: \*Environmental politics, \*Bureaucra-\*Public interest.

cy, \*Public interest, Resource management agencies, Resource management, Litigation, Environmental policy, Policy making.

Most existing resource management agencies are experiencing difficulties as a result of recent developments in environmental politics. Political agencies at all levels of government appear to have reached a point at which their behavior and performance are unacceptable to a substantial, vocal, and growing segment of the American public. This movement will not accept the claim of resource managers to determine future resource uses al-most exclusively on professional grounds. The environmentalists argue that decisions about resources must be made by a larger public than is represented by interests likely to gain from the economic or productive use of those resources. The reluctance of resource management agencies to recognize the legitimacy of this claim is a principal reason why the politics of the environment is marked by some tough and protracted political struggles and an increasing amount of litigation. In the future, bureaucratic response to environmental politics will have to contend increasingly with much stronger public rights in two respects. The agencies will have to show upon pain of litigation, that all relevant interests are afforded access to information and the decision making procedures relevant to environmental policy issues. Second, they will have to establish and adhere to clearer public procedures and criteria for making value choices. One probable consequence of these changes, in the short run, is a slowing down of the policy-making process. In the long run, we may expect to find new kinds of organizations whose purpose is to articulate the interests and values of ome part of the public in environmental affairs. (Davis-Chicago) W72-05693

POLLUTION CONTROL LOANS, Senate, Washington, D.C. G. Nelson.

Congressional Record, Vol 117, No 142, S 15216-15217 (daily ed) September 28, 1971.

Descriptors: \*Pollution abatement, \*Treatment facilities, \*Loans, \*Financing, \*Standards, Government finance, Federal government, Local Government mance, Federal government, Local governments, Water pollution control, Project planning, Legislation, Legal aspects, Water pollu-tion sources, Grants, Interest, Participating funds, Industrial plants. Identifiers: \*Small business.

Many small businesses are unable to comply with pollution control requirements due to the costs of facilities needed to meet new standards. To protect both small businesses and the environment, Senator Nelson proposed a bill authorizing long-term, low-interest federal loans, from the Environmental Protection Agency, to small business firms that would suffer serious, adverse economic consequences in meeting water pollution control standards. The bill would restrict loans to small businesses, as defined under the Samil Business Act. Strict safeguards assure that loans will be made only in accordance with the objectives of the legislation. Facilities financed by the loans must be certified as necessary to meet state and federal pollution control requirements. The applicant would be required to show that without a loan he could not meet the standards and continue to operate his business. Municipal waste treatment plants should also be improved through a federal financing program that would pay 90% of the costs. (Horwitz-Florida) W72-05742

CONSERVATION, POLICY AND THE ROLE OF

COUNSEL, Maine Univ., Portland. School of Law. D. J. Halperin.

Maine Law Review, Vol 23, No 1, p 119-141, 1971. 23 p, 69 ref.

Descriptors: \*Maine, \*Estuarine environment, \*Land use, \*Environmental effects, \*Adjudication procedure, Water law, Public rights, Administration, Competing uses, Eminent domain, Economics, Judicial decisions, State governments, Land tenure, Legislation, Non-structural alternatives, Permits, Regulation, Public health, Water resources development, Planning, Environ-mental sanitation, Legal aspects.

The role of counsel in helping the legal process ac-commodate new conservation policies is explored. A case eventually decided by the highest court of Maine is studied and the actions of counsel in preparing and handling the trial and appeal are evaluated. The case involved a constitutional challenge to Maine's regulatory sheme requiring a permit to fill coastal wetlands. Counsel for the State, trying to prevent the filling at issue, should not have allowed this factual situation to be utilized as a test case: the fact, the law, and the equities all favored the parties attempting to fill. Moreover, the state should have demonstrated the ecological significance of the specific parcel of land, rather than the entire area. The State also blundered by establishing the basic element of the opposition's case: there were no possible uses of the land in question other than in a filled state. Weaknesses in the regulatory scheme's decision making ap-paratus are also evaluated. (Johnson-Florida) W72-05743

A BILL TO AMEND THE FEDERAL POWER A BILL TO AMEND THE FEDERAL POWER
ACT WITH RESPECT TO THE JURISDICTION
OF THE FEDERAL POWER COMMISSION
OVER STREAMS AND OTHER BODIES OF
WATER THE NAVIGABLE PORTIONS OF
WHICH LIE WITHIN A SINGLE STATE.
House Bill No 1244, 91st Cong, 1st Sess. (1969). 6

### Field 06-WATER RESOURCES PLANNING

### Group 6E-Water Law and Institutions

Descriptors: \*Federal Power Act, \*Navigable waters, \*Permits, \*Federal jurisdiction, \*Hydroelectric power, Bodies of water, Hydroelectric plants, Dam construction, Reservoir construction, Operation and maintenance, State governments, Cities, Navigation, Public lands, Transportation, Administrative agencies, Regulation, Federal government, Legislation, Legal aspects.

The Federal Power Act would be amended to redefine 'navigable waters' to be those over which Congress has jurisdiction through its authority to regulate interstate and foreign commerce and which either in a natural or improved condition, notwithstanding interruptions, are suitable for transporting persons and property. Waters lying wholly within one state are expected. Authority is provided for the issuance of licenses to United States citizens, corporations, states, and cities for the construction, operation, and maintenance of dams, reservoirs, powerhouses, transmission lines, and other projects necessary for developing and improving navigation and power transmission along navigable waters or upon public lands. Licenses issued within any federal reservation or affecting the navigable capacity of navigable waters or regulating any government dam that may be used by the United States for public purpose must be considered by specified agencies. It would be unlawful for any person, state, or city to develop electrical power in navigable waters upon public lands, except under a permit or right-of-way granted prior to June 10, 1920, or a license granted pursuant to this Act. (Rees-Florida) W72-05744

A BILL TO CLARIFY THE RELATIONSHIP OF INTERESTS OF THE UNITED STATES AND OF THE STATES IN THE USE OF THE WATERS OF CERTAIN STREAMS. House Bill No 18943, 90th Cong, 2d Sess (1968). 5

Descriptors: \*Water rights, \*Eminent domain, \*Public lands, \*Federal-state water rights conflicts, Land tenure, Remedies, Federal government. State governments, Jurisdiction, aspects, Damages, Riparian rights, Prior appropriation, Public rights, Water law, Condemnation, Legislation, Federal jurisdiction, State ju-

Under the terms of this Bill, the withdrawal or reservation of surveyed or unsurveyed lands of the United States would not affect rights to the use of navigable or non-navigable waters acquired pursuant to state law. Rights may be affected, how-ever, by federal statute or an officer of the United States authorized to make withdrawals or reservations, of such promulgation antedates the initiation of the conflicting right under state law. Any right to the diversion, storate, distribution, or use of water which the United States asserts as established under state law shall be treated as a right accorded by state law for the use of water by parties other than the United States. All vested rights to the diversion, storage, or use of waters acquired under state laws and recognized as being compensable are protected and may not be taken or impaired without just compensation. The United States shall provide compensation for vested rights taken or impaired through voluntary agreements or eminent domain proceedings. (Horwitz-Florida) W72-05745

LIABILITY FOR DAMAGES FROM OBSTRUC-TION OF STREAM BY DEBRIS OR WASTE. American Law Reports, Annotated, Vol 54, p 358-360, 1928. 3 p.

Descriptors: \*Remedies, \*Obstruction to flow, \*Flood damages, Legal aspects, Damages, Water pollution, Riparian rights, Judicial decisions, Water law, Water policy, Streamflow, Streams,

Generally, one who obstructs a stream with debris or waste material is liable for damages caused thereby. For example, when a logging company permits tree branches and other debris to fall into a stream it will generally be held liable for a resulting flood. The logging company will be liable for damages to the land and crops thereon, despite the fact that logging operations were conducted in accordance with logging industry customs. An ex-ception to this general rule exists where the party causing the obstruction cannot reasonably foresee the condition causing the damage. This exception is illustrated in a Montana case where a culvert over which defendant railroad placed its tracks became clogged with debris washed down by an unusually heavy storm. The court held that since the storm was an unusual one which the defendant had no reason to anticipate and the culvert was not inadequate under ordinary circumstances, the de-fendant should not be held liable. Cases from numerous jurisdictions are cited and evaluated. (Horwitz-Florida) W72-05746

A BILL TO AMEND THE FEDERAL POWER ACT WITH RESPECT TO THE JURISDICTION OF THE FEDERAL POWER COMMISSION OVER STREAMS AND OTHER BODIES OF WATER THE NAVIGABLE PORTIONS OF WHICH LIE WITHIN A SINGLE STATE. House Bill No 257, 92d Cong, 1st Sess (1971). 6 p.

Descriptors: \*Federal power Act, \*Navigable waters, \*Federal jurisdiction, \*Permits, \*Hydroelectric power, Electric power, Legislation, Federal government, State governments, Local governments, Jurisdiction, Legal aspects, Administration, Administrative agencies, Power-plants, Facilities, Dam construction, Project

Navigable waters would be defined to include parts of streams or other bodies of water which either in their natural or improved conditions are used or suitable for use for the transportation of persons or property in interstate or foreign com-merce. All interruptions of navigable waters such as falls, shallows, or rapids, as well as other parts of streams authorized by Congress for improve-ment, would be included within federal jurisdiction. All bodies of water whose navigable waters lie wholly within the territorial limits of a single state would be excluded from federal jurisdiction. Any person, state, or local government must ob tain a license in order to construct, operate, and maintain dams, water conduits, reservoirs, powerhouses, transmission lines, and other project works necessary for the development of power along, across, or from any navigable waterway. A permit must be obtained from the Federal Pow Commission to lawfully operate or construct such facilities. The Commission shall conduct an investigation of all proposed construction, as soon as application is filed, to determine the effect of the project upon the interests of interstate and foreign commerce. (Horwitz-Florida)

A BILL TO AUTHORIZE THE SECRETARY OF THE ARMY TO GRANT RIGHTS OF STORAGE AND TRANSPORTATION ON FLOOD CON-TROL PROJECTS.

Senate Bill 1296, 89th Cong, 1st Sess (1965). 1 p.

Descriptors: \*Transportation, \*Storage, \*Reservoir operation, \*Federal project policy, Reservoir sites, Impounded waters, Flood control, Regulation, Reservoirs, Water management (Applied), Dams, State governments, Farms, Forests, Mining, Industrial production, United States, Federal government, Legislation, Legal aspects.

In accordance with terms and conditions determined necessary to protect the interests of the United States, the Secretary of the Army would be authorized to grant to states, political subdivi-sions, and any persons rights of storage and transportation on the waters of dam reservoirs created by flood control projects. Products which could be stored or transported include farm, forest, mine, and industrial products. (Smiljanich-Florida) W72-05748

RIGHT OF RIPARIAN OWNER TO EMBANK AGAINST FLOOD OR OVERFLOW FROM STREAM.

American Law Reports, Annotated, Vol 16, p 629-649, 1922. 21 p.

Descriptors: \*Embankments, \*Riparian rights, \*Judicial decisions, \*Overflow, \*Flood protection, Flood damage, Flood control, Streambeds, Navigable waters, Surface runoff, Floodwater, Alteration of flow, Relative rights, Remedies, Riparian land, Mississippi River, Ohio River, Legal aspects, Water level fluctuations, Surface Remedies water, Damages, Levees, Dikes, Floods, Riparian

The general rule is that a riparian owner may em bank against ordinary flood water of a stream only if it does not cause injury to another riparian's land. If material or substantial injury is established, a cause of action for damages will lie. A riparian landowner may embank against extraordinary flood waters of a stream, even if it causes injury to another riparian's land. The distinction between ordinary and extra-ordinary flood waters is a fact question depnding upon regularity, foreseeability, and magnitude . Cases are analyzed. A minority of jurisdictions permit embankment against ordinary flood waters by classi-fying the superinundation as surface water, which any landowner may embank against. The majority view considers surface water to be that which has become detached from the stream, a question of fact. A riparian owner's right to embank against overflow caused by an embankment on the opposite side of the stream is also analyzed. The common enemy rule is discussed, as are other exceptions, modifications, and limitations of the general rule. (Grant-Florida)
W72-05749

RIGHT OF RIPARIAN LANDOWNERS TO CONTINUANCE OF ARTIFICIAL CONDITIONS ESTABLISHED ABOVE OR BELOW THEIR

LAND, P. H. Vartanian. American Law Reports, Annotated, Vol 88, p 130-150, 1934. 21 p.

\*Riparian rights, Descriptors: \*Easements. \*Prescriptive rights, Legal aspects, Judicial decisions, Mill dams, Reasonable use, Artificial watercourses, Dams, Water rights, Land tenure, Damages, Remedies, Third party effects, Canals, Drainage practices.

A riparian owner's right to have artificial condition, established above or below his land, undisturbed is often asserted on grounds that the continuance of such conditions for the requisite period of time vests the riparian, incidentally benefited, with a prescriptive right. Many jurisdic-tions have denied the existence of such a right, because the essential element of an adverse user is generally lacking. Other jurisdictions hold to the contrary on the theory that the owner of adjoining land acquires a reciprocal easement, or right to enjoy the benefits of the improvement, and the owner of such improvements must refrain from acts which would destroy the improvement or lessen its benefits. Prescriptive rights are more often allowed where the riparian landowner has imanowed where the fiparian landowid has an proved his land relying upon the continuance of such improvements. Cases relating to channels, dams, drainage ditches, and other miscellaneous improvements are evaluated. (Horwitz-Florida) W72-05750

A BILL TO PROVIDE FOR THE ESTABLISH-MENT OF THE BUFFALO NATIONAL RIVER IN THE STATE OF ARKANSAS. House Bill No 8382, 92d Cong, 1st Sess (1971). 7 p.

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Descrip tion, \*1 Legislat Descriptors: \*Wild rivers, \*National parks, \*Legislation, \*Federal government, Conservation, Federal jurisdiction, Recreation facilities, Recreation, Hunting, Fishing, Regulation, Natural resources, Water policy, Electric power production, Federal Power Act, Administration.

Identifiers: \*Buffalo River, \*National rivers.

For purposes of conserving an area containing unique scenic and scientific features and preserving as a free-flowing stream an important sement of the Buffalo River in Arkansas, the Secretary of the Interior would be authorized under terms of this Bill to establish and administer the Buffalo National River. Within the boundaries of the National River, the Secretary may acquire lands and waters. The Secretary shall permit hunting and fishing on such lands and waters, in accordance with federal and state laws. The Secretary may, however, designate zones where, and periods when, no hunting or fishing shall be permitted for reasons of public safety, administration, fish or wildlife management, or public use and enjoyment. The Federal Power Commission shall not license construction of any project, under the Federal Power Act, on or directly affecting the Buffalo National River. No department or agency of the United States shall assist in the construction of any water resources project that would have a direct and adverse effect on the values for which the National River is established. (Horwitz-Florida)

# A BILL TO AMEND THE WATERSHED PROTECTION AND FLOOD PREVENTION ACT, AS AMENDED.

House Bill No 8164, 92d Cong, 1st Sess (1971). 4 p.

Descriptors: \*Water pollution control, \*Watershed Protect. and Flood Prev. Act, \*Contracts, \*Land use, \*Soil conservation, Farms, Federal government, State governments, Jurisdiction, Administration, Administrative agencies, Legal aspects, Public health, Water pollution, Irrigation, Reclamation, Watershed management, Crops.

The Secretary of Agriculture would be authorized to enter into agreements based on a conservation plan with landowners, operators, and occupiers to be carried out during a period not exceeding ten years. Such plans shall provide for changes in cropping systems and land uses; soil and water conservation practices; and measures needed to conserve and develop soil, water, woodland, wildlife, and recreational resources. Watershed and subwatershed plans may be incorporated in such agreements. The cost of carrying out such agreements shall be shared by the federal government. Any plan for works or improvements involving an estimated federal construction contribution in excess of \$250,000; any structure having a total capacity in excess of 2,500 acre feet, including works of improvement for reclamation, irrigation, or the prevention, control, and abatement of water pollution; or projects affecting public or other lands or wildlife under jurisdiction of the Secretary of Hattrior, shall be submitted to the Secretary of Hattrior, shall be submitted to the Secretary of Hatmy, and the Secretary of Interior for recommendations. (Horwitz-Florida)

NAVIGABLE WATERS SAFETY AND ENVIRONMENTAL QUALITY ACT OF 1971 (A BILL TO PROMOTE THE SAFETY AND PROTECT THE ENVIRONMENTAL QUALITY OF PORTS, WATERFRONT AREAS, AND THE NAVIGABLE WATERS OF THE UNITED STATES).

STATES). House Bill No 9581, 92d Cong, 1st Sess (1971). 13

Descriptors: \*Navigable waters, \*Ships, \*Regulation, \*Water pollution control, Legal aspects, Legislation, Water pollution sources, Federal government, Jurisdiction, Administration, Administrative agencies, Permits, Remedies, Damages, Oil industry, Public health, Project planning, Oceans.

Under the terms of this Bill, Congress finds that is is necessary to establish, for all vessels carrying liquid cargo in bulk, comprehensive minimum standards of design, construction, maintenance, and operation. These are intended to prevent or mitigate hazards to life, property, and natural resources. The secretary of the department in which the Coast Guard is operating shall establish rules and regulations with respect to the design, construction, alteration, and repair of such vessels; as well as regulations for the handling and storage of liquid cargoes. The secretary is required to issue permits and conduct inspections to insure compliance. The secretary shall also certify the competency of officers and tankermen on such vessels. Penalties prescribed for violations include maximum civil penalty of \$100,000 and a maximum criminal penalty of \$100,000, or no more than ten years in prison. In order to prevent damage due to accidents, the secretary may also establish vessel traffic service systems to control vessel movement into and out of ports. (Horwitz-W72-05753

# CHARACTER OF EASEMENT IN RESPECT OF WATER AS ONE IN GROSS OR APPURTENANT.

American Law Reports, Annotated, Vol 89, p 1187-1197, 1934. 11 p.

Descriptors: \*Easements, \*Water rights, \*Land tenure, \*Land use, Legal aspects, Water law, Judicial decisions, Right-of-way, Economics, Real property, Water resources, Water resources development, Water users, Water utilization, Wells, Springs, Dams, Drainage, Domestic water, Relative rights, Riparian rights.

Identifiers: \*Easements appurtenant, \*Easements in gross.

An easement in gross is a right of one person in respect to land of another person. It is not considered as being attached to the land. Generally, an easement in gross is personal to the holder and is not inheritable or assignable. Easements appurtenant, however, attach to the land and are alienable. In determining whether an easement is in gross or appurtenant, courts look to the nature of the right and the intention of the parties creating it. Easements in gross are not favored and will not be presumed when the easement can fairly be construed as appurtenant. Numerous illustrative cases of both types of easements are set forth. Generally, grants made to a person or his heirs or assigns or grants made for as long as the land is used in a specific manner are construed as easements appurtenant. Courts have found easements in gross in many situations where they were unable to find a piece of land to which the easement could attach. (Johnson-Florida) W72-05754

### EXTENT OF DETENTION OR RETARDATION OF WATER INCIDENT TO RIPARIAN RIGHTS.

American Law Reports, Annotated, Vol 70, p 220-241, 1931. 22 p.

Descriptors: \*Riparian rights, \*Reasonable use, \*Obstruction to flow, \*Natural flow doctrine, Relative rights, Legal aspects, Water law, Competing uses, Judicial decisions, Third party effects, Water allocation (Policy), Water rights, Mill dams, Alteration of flow, Water utilization, Evaporation, Riparian water loss, Diversion, Natural use, Water storage.

Although a riparian owner is entitled to interrupt, to some extent, the natural flow of a watercourse, difficulty exists in determining to what extent such interruptions may occur. This annotation deals

with interruptions which are wrongful because lower proprietors are deprived of their rights to benefits incidental to the natural flow of the stream. American cases have generally held that the lower riparian is entitled to the natural flow of a stream without material diminution or alternation, unless such loss results from a 'reasonable detention' by an upper riparian owner. The total circumstances of the situation determine what constitutes a reasonable detection. The rule of reasonable detention is discussed in relation to: (1) suitableness of works to the stream, (2) obstruction for several days, (3) purpose of the detention, (4) general storage, and (5) evaporation and absorption. It is generally held that it is not reasonable to detain water for several days, unless it is to build up a head for power purposes. It is also unreasonable to detain water for mere storage purposes or for a malicious purpose. (Johnson-Florida)

### THE NAVIGATION SERVITUDE AND THE SEVERANCE DOCTRINE.

SEVERANCE DOCTRINE, South Dakota Univ., Vermillion. School of Law. J. Munro.

J. Mullio. Land and Water Law Review, Vol 6, No 2, p 491-510, 1971. 20 p, 63 ref.

Descriptors: \*United States, \*Condemnation value, \*Non-navigable waters, \*Navigable waters, \*Federal-state water rights conflicts, \*State jurisdiction, Water rights, Federal government, Legal aspects, Water law, Riparian rights, Easements, Prior appropriation, Federal reclamation law, Eminent domain, Judicial decisions, Land tenure, Legislation, State governments, Federal Power Act, Water resources development, Ownership of beds, Federal jurisdiction.

Identifiers: \*Navigation servitude doctrine, \*Severance doctrine.

The complexities, implications, and ramifications surrounding the navigational servitude doctrine are examined. A recent expansion of the doctrine the Supreme Court recognized an overriding federal claim to waters to which the United States may be riparian. This expansion may cancel water rights long vested in private or municipal hands. There are sound arguments to refute the dominance of any federal system over established state systems. One argument is the severance doctrine, whereby waters from non-navigable sources are considered severed from the public domain and subject to state law. Another argument is that Congress in its legislation has insisted on recognizing the vested nature of state-created water rights. Also discussed are the difficulties encountered by courts in determining what property, when taken for power purposes, is non-compensable. Four points are made: (1) navigational servitude is a valid concept, (2) the Supreme Court has expanded this concept beyond a defensible basis, (3) the Pelton case and Arizona v. California raise questions as to the validity of western water rights and should be re-examined, and (4) federal agencies should work with the states and recognize state cognizance over water rights. (Johnson-W72-05756

## WATER AND RELATED LAND RESOURCES PLANNING, A POLICY STATEMENT. Water Resources Council, Washington, D.C.

Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06B. W72-05757

A BILL TO AMEND SECTION 8 OF THE FEDERAL WATER POLLUTION CONTROL ACT.

Congress, Washington, D.C.; and Senate, Washington, D.C.

Congressional Record Vol 117, No 65, p S6257-6258 (daily ed) May 5, 1971. 2 p.

### Field 06-WATER RESOURCES PLANNING

### Group 6E-Water Law and Institutions

Descriptors: "Grants, "Treatment facilities, "Participating funds, "Waste treatment, "Federal government, Water pollution, Water quality, State governments, Local governments, Jurisdiction, Legislation, Financing, Water pollution control, Political aspects, Water quality control, Allotments, Waste disposal.

Identifiers: \*Water Pollution Control Act.

Senator Nelson introduced an amendment to section 8 of the Federal Water Pollution Control Act relating to federal grants for treatment works construction. The amendment will increase federal funding to 90% of the costs for the construction or upgrading of municipal waste treatment plants. Adopting the 90-10 finance formula is the best way to accomplish the objective of protecting the Nation's water resources. Present financial burdens upon state and local governments preclude them from effectively coping with pollution, without increased federal aid. To finance the program \$25 billion would be appropriated over the next five years. To achieve the most effective waste treatment levels possible, the administrator of the Environmental Protection Agency, in issuing permits for disposal of wastes in the ocean, should require the adoption of the best avilable waste treatment or recycling method. (Horwitz-Florida)

WATER QUALITY IMPROVEMENT ACT OF 1968 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED, RELATING TO THE CONSTRUCTION OF WASTE TREATMENT WORKS, AND FOR OTHER PURPOSES).

Senate Bill No. 3206, 90th Cong, 2d Sess. (1968). 16 p.

Descriptors: \*Boating regulations, \*Treatment facilities, \*Standards, \*Federal government, \*Coast Guard regulations, United States, Legislation, Water law, Legal aspects, Administration, Administrative agencies, Economics, Public health, Jurisdiction, Water Quality Act, Waste disposal, Sewage disposal, Environmental sanitation, Sanitary engineering, Ultimate disposal, Water pollution control.

Identifiers: \*Marine toilets.

This Bill would authorize the Secretary of the Interior to promulgate federal performance standards for marine sanitation devices. Such standards would be designed to prevent the discharge of untreated or inadequately treated sewage from vessels. The Secretary would be required to consult with the Commandant of the Coast Guard and give appropriate consideration to available technology and economic costs. The Commandant would promulgate regulations governing the design, construction, installation, and operation of any marine sanitation device on board a vessel. Exempted from coverage by such standards would be existing commercial fishing vessels, forty-five feet or under in length, and new or existing vessels not equipped with installed toilet facilities. Standards and regulations may distinguish among classes, types, and sizes of vessels. Upon application of a manufacturer, the Commandant would certify the device upon a determination that it met appropriate standards and regulations. All devices substantially the same as the device tested and certified would be deemed in conformity with the regulations. A marine sanitation device is defined as any equipment on board a vessel designed to receive, retain, treat, or discharge sewage. (Johnson-Florida) W72-05759

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO AUTHORIZE RESEARCH AND DEMONSTRATION PROGRAMS FOR THE CONTROL OF LAKE POLLUTION AND ACID AND OTHER MINE WATER DRAINAGE, AND TO PREVENT POL-

LUTION OF WATER BY OIL.

Senate Bill No. 2760, 90th Cong, 1st Sess. (1967). 10 p.

Descriptors: \*Water pollution control, \*Mine wastes, \*Oil wastes, \*Lakes, \*Research and development, Water resources development, Federal government, Water pollution sources, Mine drainage, Ships, Structures, Navigable waters, Administrative agencies, Organizations, Contracts, United States, Economic feasibility, Costs, Discharge (Water), Remedies, Legal aspects, Financing, Grants.

Identifiers: \*Water Pollution Control Act, Demonstration projects.

The Federal Water Pollution Control Act would be amended to authorize contracts with, or grants to. public and private agencies, organizations, and individuals for the purpose of developing and demonstrating new or improved methods for prevention, removal, and control of natural or manmade pollution in lakes and to carry out any project which will demonstrate feasible and practical techniques of eliminating or controlling acid or other mine water pollution. Criteria for selecting watershed or drainage areas are outlined. Federal participation is subject to enumerated conditions, and \$15,000,000 is initially authorized. The Act also is amended to provide for oil pollution control. Terminology used in this section is defined. Except for an emergency imperiling life or proper-ty, an unavoidable accident, or as provided by regulation as permissible, any discharge of oil into navigable waters is unlawful. Civil and criminal penalties are provided for owners and operators of vessels or shore installations violating the Act. Removal of discharged oil by the violator or by the federal government at the violator's expense is provided. Regulations and enforcement methods are outlined. (Rees-Florida) W72-05760

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO AUTHORIZE RESEARCH AND DEMONSTRATION PROGRAMS FOR THE CONTROL OF LAKE POLLUTION AND ACID AND OTHER MINE WATER DRAINAGE, AND TO PREVENT POLLUTION BY OIL.

House Bill No. 14000, 90th Cong, 1st Sess. (1967). 10 p.

Descriptors: \*Lakes, \*Oil wastes, \*Acid mine water, \*Water pollution control, United States, Damages, Navigable waters, Watersheds, Water pollution sources, Mine acids, Mine water, Pollution abatement, Administrative agencies, Administration, Oil industry, Federal government, Water pollution, Legislation, Legal aspects. Identifiers: \*Water Pollution Control Act.

The bill, amending the Federal Water Pollution Control Act, authorizes research and demonstration programs for the control of lake pollution and acid and other mine water drainage, and to prevent pollution by oil. It provides that the Secretary of the Interior may enter into contracts with, or make grants to, public or private agencies and individuals for the development of new or improved methods of prevention, removal, and control of pollution, including the undesirable effects of nutrients and vegetation. The Secretary is also authorized to make grants to implement a project to control acid or other mine water pollution. Additionally, he is authorized to enter into agreements with any state to carry out projects which will demonstrate methods for the control, within a watershed or drainage area, of acids or other mine water pollution. Criteria for the selection of the water pollution of the drainage area are enumerated. Federal participation in such projects shall be subject to certain specified conditions. Additionally, the act makes unlawful the discharge of oil into the navigable waters or adjoining shorelines of the United States. Fine, imprisonment, civil penalty,

and removal damages are imposed for violations. (Shelnut-Florida)
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CITY OF NEW YORK V. SCHWARTZ (TAX STATUS OF RIPARIAN RIGHTS).

320 N.Y.S.2d 983-986 (App. Div. 1971). 4 p.

Descriptors: \*New York, \*Riparian rights, \*Taxes, \*Assessments, Real property, Judicial decisions, Legal aspects, Legislation, Riparian land. Water law.

Plaintiff riparian owner sued defendant tax assessor to cancel a real property tax assessment. Defendant had placed plaintiff's riparian rights, acquired seventeen years earlier, on the tax rolls. Plaintiff contended that riparian rights which were severed from land were not assessable within the real property tax law. The New York Supreme Court, Appellate Division, held that riparian rights once severed from land to which they were appurtenant do not become real property within New York's real property tax law, and are therefore not assessable. Plaintiff's riparian rights were in corporeal hereditaments and thus constituted real property interests for some purposes. However, the court ruled that such interests were not subject to assessment absent specific statutory authorization. While riparian rights appurtenant to riparian land are assessable, riparian rights severed from land are not land itself within New York's statute, even though they are classified as interests in real property. (Shelnut-Florida)

TATUM V. PARISH OF EAST BATON ROUGE (LIABILITY FOR PARISH DRAINAGE DITCH), 244 So.2d 913-915 (Ct. App. La. 1971).

Descriptors: \*Louisiana, \*Drainage systems, \*Hazards, \*Riprap, Erosion control, Accidents, Surface drainage, Ditches, Drains, Canals, Channels, Erosion, Diversion structures, Damages, Legal aspects, Legislation.

Plaintiff parents brought a wrongful death action for their minor son's death by drowning in a water filled hole in the bottom of a dry drainage ditch owned and maintained by defendant parish. The hole resulted from erosion as water from subdivision drainage pipes emptied into the ditch. The hole could have been prevented by placing riprap, irregular chunks of concrete, where the pipes drained into the ditch. Defendant had cleared the canal after the placement of the drainage pipes. Plaintiffs were awarded general and special damages by the trial court on grounds that defen-dant had been negligent. Defendant, on appeal, objected to the lower court's findings of constructive notice of the hole's existence and that plaintiffs had not been contributorily negligent. The Court of Appeal of Louisiana, First Circuit, held that defendant: (1) had constructive notice of the dan gerous condition, because its agents knew of the absence of riprap; (2) had negligently allowed a hazardous condition, in the nature of a trap, to exist; and (3) should have known that children would play in the ditch located a short distance from a school path. The award of general and special damages was affirmed. (Rees-Florida) W72-05763

DICKIE V. WOOD-HOPKINS CONTRACTING CO. (LIABILITY OF BULKHEAD OWNER FOR FAILURE TO PROVIDE WARNING LIGHTS). 245 So.2d 663 (Ct. App. Fla. 1971).

Descriptors: \*Florida, \*Bulkheads, \*Channels, \*Boats, Safety, Warning systems, Navigation, Lighting, Legal aspects, Judicial decisions.

Plaintiff vessel operator sought to recover damages for personal injuries from defendant bulkhead owner. The bulkhead was on the shore

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side of the federal bulkhead line and had been approved by the Trustees of the Florida Internal Im-provement Fund, United States Army Corps of Engineers, and the City of Jacksonville. The ap-Engineers, and the City of Jacksonville. The approved plans did not require any lighting or warning devices on the bulkhead. While plaintiff was operating his boat at night, outside the marked and lighted channel, he collided with defendant's bulkhead. Plaintiff contended that defendant negligently failed to place lights and warning devices on the bulkhead. At trial, the court rendered summary judgment for defendant, holding that defendant violated no duty owed to plaintiff. Plaintiff appealed this holding. The Florida tiff. Plaintiff appealed this holding. The Florida First District Court of Appeal affirmed the trial court's judgment in favor of defendant. (Hart-Florida) W72-05764

SILVER BLUE LAKE APTS, INC. V. SILVER BLUE LAKE HOME-OWNERS ASS'N. (VALIDITY OF RESTRICTION ON USE OF LAKE AGAINST LITTORAL OWNERS NOT PRIVY TO RESTRICTION).

245 So.2d 609-618 (Fla. 1971). 10 p.

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Descriptors: \*Florida, \*Lakes, \*Contracts, \*Land tenure, Non-navigable waters, Real property, Relative rights, Remedies, Recreation. Identifiers: \*Equitable servitude, Injunction (Prohibitory).

Plaintiff home owners' association sought to enjoin defendant apartment corporation from using the nonnavigable, artificial lake upon which their respective properties abutted. Defendant's apart-nents were on a pie-shaped tract, and only a small portion of it abutted on the lake. Plaintiff had reviously prevented rezoning of defendant's tract or commercial purposes. The common grantor onveyed the lake bed to plaintiff with a clause stricting use of the lake to members of the asit to resist subsequent rezoning of the tract later nveyed to defendant. Defendant knew of the striction, but did not take subject to it. When dendant's tenants used the lake, plaintiff brought is action. Defendant contended it was not bound the restriction because: (1) its deed was not bject to the restriction, (2) it owned a portion of e lake; and (3) it was not privy to the restrictive ed. The Florida supreme court, however, held at the restriction created an equitable servitude and defendant was bound because of its actual otice of the restriction and especially because deendant received the benefit of the rezoning. injunction against defendant was affirmed. (Hart-W72-05765

POOLE V. GUSTE (LIABILITY FOR OBSTRUCTING SURFACE DRAINAGE).

246 So.2d 353-361 (Ct. App. La. 1971). 9 p.

Descriptors: \*Louisiana, \*Repulsion (Legal aspects), \*Surface runoff, \*Levees, Surface water, Drainage, Ditches, Lumber, Damages, Flooding, Flood damages, Legal aspects, Judicial decisions, Eastments, Relative rights, Real property, Land tenure. Identifiers: Injunction (Mandatory).

Plaintiff landowners brought an action to enforce drainage servitude over defendant landowners' property. Plaintiffs also sought to recover damages for injury to their lands and timber caused by the obstruction of surface water flow. Plaintiffs' and defendants' properties were contiguous, and a drainage canal passed across them. Cendants constructed a levee across their land and the canal. Subsequently, surface water backed up onto plaintiffs' land. Plaintiffs claimed drainage servitude. Defendants denied that plaintiffs' land was 'above' their land, and also denied that any obstruction or damage had occurred. By statute, a drainage servitude existed only if plaintiffs' lands

were higher and water drained naturally from it across defendants' land. The Louisiana Court of Appeal held that plaintiffs had established meeting these conditions by a preponderance of the evidence. Therefore, the court ruled that plaintiffs held a drainage servitude. Injunctions issued by the trial court, compelling defendants to restore the drainage, were affirmed, as were damages awarded for plaintiffs' lost timber. Defendants' assertion that plaintiffs had tortiously broken defenlevee, and should therefore be denied equitable relief, was rejected by the court. (Hart-Florida) W72-05766

UNITED STATES V. ANCHORAGE, ALASKA (OWNERSHIP OF SUBMERGED LANDS RESERVED BY THE UNITED STATES).

437 F.2d 1081-1085 (9th Cir. 1971), 5 n.

Descriptors: \*Alaska, \*United States, \*Sub-merged Lands Act, \*Ownership of beds, Beds under water, Cities, State governments, Legislation, Railroads, Federal government, Land tenure, Real property, Beds, Tidelands.

Plaintiff United States brought action to quiet title to certain tidelands and submerged lands which defendant municipality alleged that it owned. Before Alaska was admitted as a state, plaintiff con-structed a railroad connecting the Pacific harbor at Anchorage to interior navigable waters. The Congressional Act creating the railroad authorized plaintiff to reserve lands as a necessary adjunct to the railroad. President Wilson reserved, pursuant to the Act's authority, submerged lands including the mouth of Ship Creek for the Alaska Railroad Terminal Reserve. Upon admission to the Union, however, Alaska claimed all tidelands and submerged lands within its boundaries. The disputed lands underlying Ship Creek and other previously submerged lands filled by the Alaska Railroad were conveyed to defendant municipality. Plaintiff contended it owned the disputed lands via the presidential reservation and the Submerged Lands Act. Conversely, defendant contended the lands passed to Alaska on admission as a state. The United States Ninth Circuit Court of Appeals held that the lands were reserved to the United States by executive order, and that Alaska's admission did not alter the ownership of the United States.

LOUISIANA STATE RICE MILLING CO, INC. V. GAGE (LIABILITY FOR FAILURE TO PER-FORM IRRIGATION CONTRACT). 7 La. App. 66-68 (1927).

Descriptors: \*Louisiana, \*Rice, \*Contracts, \*Irrigation, Legal aspects, Judicial decisions, Saline water, Impaired water quality, Remedies, Agricul-

Plaintiff rice milling company sued defendant rice grower for breach of a written irrigation contract. Plaintiff had agreed to furnish adequate pure water to irrigate defendant's rice crop, in return for a one-fifth share. When defendant refused to give up the one-fifth share, plaintiff had it sequestered. Defendant asserted that plaintiff had not properly performed, because its water supply became salty and could not be used. After demands from defendant for plaintiff to furnish pure water, plaintiff admitted its inability to perform. Hence, defen-dant was forced to obtain water elsewhere after plaintiff's water had been used for one irrigation. Plaintiff sought to recover a ratable portion of the crop based upon the amount of water furnished. The Louisiana court of appeals, however, found the contract inseverable and held that plaintiff could not recover. Accordingly, the w sequestration was dissolved. (Hart-Florida) W72-05768

LOUISIANA STATE RICE MILLING CO, INC. V. BAKER (LIABILITY FOR FAILURE TO PER-FORM IRRIGATION CONTRACT). 5 La. App. 751-753 (1927).

Descriptors: \*Louisiana, \*Contracts, \*Irrigation, \*Impaired water quality, Rice, Legal aspects, Judicial decisions, Saline water, Water pollution sources, Agriculture, Water quality, Remedies.

Plaintiff rice milling company sued defendant rice grower for breach of contract. Plaintiff had agreed to furnish adequate pure water to irrigate defendant's rice crop, in return for a one-fifth share of dant's rice crop, in return for a one-fifth share of the crop. When defendant refused to give up the one-fifth share, plaintiff had that amount sequestered. Defendant asserted that plaintiff had not properly performed, because plaintiff's water became salty and could only be used for one irrigation. Defendant was forced to purchase water el-sewhere to save his crop. Nevertheless, plaintiff demanded a one-fifth share, but offered to pay one-fifth of defendant's costs of obtaining water elsewhere. Because plaintiff had abandoned the crop, the Louisiana court of appeals held that it was not entitled to a share of the crop. Defen-dant's counterclaim for damages for plaintiff's failure to furnish the water was held to be based upon a fortuitous event, for which plaintiff was not liable. (Hart-Florida) W72-05769

CHANDLER V. SCOGIN (INJUNCTION TO PREVENT OBSTRUCTION TO NATURAL DRAINAGE).
5 La. App. 484-488 (1926).

Descriptors: \*Louisiana, \*Drainage, \*Agriculture, \*Surface runoff, \*Terracing, Easements, Water injury, Water law, Judicial decisions, Legal aspects, Surface water.

Plaintiff landowner sought an injunction against, and damages from, defendant lower landowner, because defendant's terraces obstructed plaintiff's drainage. Defendant's terraces were constructed for agricultural purposes. Plaintiff did not allege that the obstruction of natural drainage caused him injury, but only that he had a right to natural drainage. The Louisiana court of appeals stated that when improvements are for agricultural pur-poses, they will not be destroyed unless they cause injury. Because the conflicting evidence failed to establish an injury to plaintiff, the court held that plaintiff was entitled to neither an injunction nor damages. (Hart-Florida) W72-05770

DOUCET V. WILFERT (LIABILITY OF CONTRACTOR FOR FAILURE TO PERFORM CONTRACT TO IRRIGATE). 4 La. App. 293-295 (1926).

Descriptors: \*Louisiana, \*Rice, \*Irrigation, \*Contracts, Farms, Profit, Legal aspects, Judicial decisions, Remedies, Damages.

Plaintiff rice grower sued defendant water supplier for lost profits from breach of contract. Defendant had agreed to irrigate plaintiff's rice in return for one-quarter of the crop. Defendant later refused to one-quarter of the crop. Detendant mer refused to perform, claiming irrigation was unjustifiably expensive. Defendant admitted failure to perform, but objected to the lower court's judgment because plaintiff failed to allege default. The Louisiana court of appeals held that plaintiff's allegation that defendant failed to furnish water was suffered. ficient. Furthermore, the court held the evidence justified the trial court finding that plaintiff's field would have produced seven sacks per acre if defendant had performed his contractual duties. Defendant also contended that plaintiff could not remaint also contended that plaintiff could not recover because the damages claimed were too remote and uncertain. This contention was re-jected because the rice was already planted and production was sufficiently certain. (Hart-Florida) W72-05771

### Field 06—WATER RESOURCES PLANNING

### Group 6E-Water Law and Institutions

COLLIER V. CITY OF MEMPHIS (MUNICIPAL LIABILITY FOR DRAINING SWIMMING POOL INTO NATURAL DITCH). 4 Tenn. App. 322-335 (1927).

Descriptors: "Tennessee, "Drainage, "Ditches, "Public health, "Local governments, Water pollution, Mosquitoes, Swimming, Recreation, Sewage, Legal aspects, Judicial decisions, Water pollution effects, Remedies, Damages. Identifiers: "Nuisance, Injunctions (Prohibitory).

Plaintiff landowners sought an injunction against defendant city and damages resulting from the drainage of a municipal swimming pool. Defendant erected a swimming pool which drained into a natural drainage ditch traversing plantiffs' land. Plaintiffs alleged that the pool water was polluted and that the stagnant water in the ditch, a breeding place for mosquitoes, created a nuisance. Plaintiffs were denied relief by the trial court. The jury found that the ditch had existed in its present state for some 40 years, the water was not polluted, and that the water did not injure either plaintiffs' land or public health. On appeal, plaintiffs urged that the verdict for defendant was erroneous. After noting that a city cannot maintain a nuisance in exercising its governmental power, the appellate court refused to grant an injunction against defendant, because plaintiffs had failed to show potential irreparable injury from the alleged trespass. Moreover, since the jury found that the pool water was not polluted or injurious to public health, the court held that the lower court properly refused to grant an injunction. The injunction granted defendant, to prevent plaintiffs from obstructing the drainage ditch, was upheld. (Hart-Florida)

### TALLEY V. BAKER (LIABILITY FOR OBSTRUCTING DRAINAGE DITCH).

3 Tenn. App. 321-325 (1926).

Descriptors: \*Tennessee, \*Ditches, \*Obstruction to flow, \*Riddance (Legal aspects), Bridges, Farms, Bridge failure, Rain, Natural flow doctrine, Easements, Relative rights, Legal aspects, Judicial decisions, Drainage, Drainage engineering.

Plaintiff farmowners sought damages and an injunction against defendant adjacent farmowners to compel removal of an obstruction in a ditch which drained the farms. Forty years previously, local farmers had dug the ditch in concert and constructed a bridge over it on defendants' land. During heavy rains, the bridge was washed out. In rebuilding the bridge, the sill of the old bridge was left in the ditch, causing it to fill with silt. The ditch subsequently overflowed and flooded plaintiffs' land. The sill was removed by defendants during the litigation. The Tennessee court of appeal observed that plaintiff had a drainage easement across defendants' land, and defendant could not obstruct the ditch. Accordingly, the court awarded damages to plaintiffs in the amount of the diminution of rental value of the acreage rendered unusable by flood damage. (Hart-Florida)

### POWERS OF LAKE AUTHORITIES. Public Act No. 416, Connecticut Legislative Ser-

Public Act No. 416, Connecticut Legislative Service, p 430 (1969). 1 p.

Descriptors: \*Connecticut, \*Lakes, \*Local governments, \*Water quality control, Algae, Aquatic weeds, Administration, Supervisory control (Power), Administrative agencies.

By amendment to Connecticut statues, legislatures of local governments are authorized to grant lake authorities power to control and abate algae and aquatic weeds, in cooperation with the State Water Resources Commission, and study water management for recommendations to local governments. Lake authorities shall have no jurisdiction in matters subject to regulation by the

Connecticut Board of Fisheries and Game. (Hart-Florida) W72-05774

A BILL TO PROMOTE THE PRESERVATION, FOR THE PUBLIC USE AND BENEFIT, OF CERTAIN PORTIONS OF THE SHORELINE AREAS OF THE UNITED STATES. Senate Bill 98, 89th Cong., 1st Sess. (1965). 6 p.

Descriptors: \*National recreation areas, \*National seashores, \*Recreation facilities, \*Coasts, \*Financing, Cost sharing, National Legislation, Federal project policy, National lakeshores, Scenery, Seashores, Shores, Beaches, State governments, Federal government, Shore protection, Parks, Recreation, Aesthetics, Natural resources, Project planning, Public benefits, United States.

Actions aimed at establishing national shoreline recreation areas and federal assistance for stateadministered shoreline recreation areas authorized in this bill. The Secretary of the Interior is directed to investigate what actions are required to preserve the following shoreline areas: (1) Cumberland Island, Georgia; (2) Huron Mountains, Michigan; (3) Channel Islands, California; (4) Fire Island, New York; (5) Cape Flattery, Washington; (6) Leadbetter Point, Washington; (7) Mosquito Lagoon, Florida; (8) Pigeon Point, Minnesota; (9) Popham-Saint John, Maine; (10) Parramoure Island, Virginia; (11) Great Salt Lake, Utah; (12) Lake Tahoe, Nevada-California; (13) Smith Island, North Carolina; and (14) the shores of Hawaii. Within two years findings shall be submitted to Congress as to: (1) actions needed to preserve such areas; (2) acquisition and development costs; (3) land procurable through donation; (4) recreational suitability; and (5) scenic, scientific, historic, and recreational values. To assist state acquisition and preservation, the Secretary may pay one-half the purchase price of state-administered shoreline recreation areas. The Secretary of Agriculture shall investigate the suitability of national forest lands as shoreline recreation areas. (Earl-Florida) W72-05775

# WATER RIGHTS ACT OF 1965 (A BILL TO CLARIFY THE RELATIONSHIP OF INTERESTS OF THE UNITED STATES AND OF THE STATES IN THE USE OF THE WATERS OF CERTAIN STREAMS).

Senate Bill 1636, 89th Cong, 1st Sess. (1965). 5 p.

Descriptors: \*Federal-state water rights conflicts, \*State jurisdictions, \*Federal jurisdiction, \*Public lands, Water rights, United States, Condemnation, State governments, Legislation, Riparian rights, Appropriation, Preferences (Water rights), Prescriptive rights, Prior appropriation, Competing uses, Land tenure, Water law, Eminent domain, Legal aspects, Contracts.

Under the provisions of this Bill, withdrawal or reservation of United States lands shall not affect any water rights acquired pursuant to state law before or after such withdrawal, unless the withdrawal antedates the conflicting state right. Water rights asserted by the United States shall be equal to water rights asserted by parties other than the United States. Just compensation will be afforded for vested rights taken by the United States. Vested rights include appropriative rights, riparian rights, and prescriptive rights. The United States is obligated to begin condemnation proceedings if agreement as to compensation cannot be reached. No statute of limitation shall run against suit by the injured party if the United States fails to bring a condemnation suit. Injunctions, however, are not authorized. (Hart-Florida) W72-05776

ARNN V. BOROUGH OF NORTH VALE (MU-NICIPAL LIABILITY FOR INADEQUATE STORM DRAIN CONSTRUCTION). 143 A. 437-438 (Ct. Err. and App. N.J. 1928).

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Descriptors: \*New Jersey, \*Storm drains, \*Storm runoff, \*Flood damage, \*Adjudication procedure, Surface drainage, Cities, Storms, Rain water, Surface water, Surface runoff, Judicial decisions, Legal aspects, Floods, Sewers, Cloudbursts, Local governments, Remedies.

Plaintiff property owner sued defendant municipality for surface water damage to his property. Plaintiff contended that defendant had installed, in a street bordering plaintiff's property, a storm drain of insufficient capacity to handle surface water runoff from rainstorms. At trial, evidence showed similar damage to other property bordering plaintiff's street. The Court of Errors and Appeals of New Jersey held the negligent breach of municipalities' public duty to install adequate storm drains is a public wrong which must be remedied by indictment. The nonsuit granted by the lower court was affirmed on grounds that defendant's breach could not form the basis for a civil action by plaintiff. (Madsen-Florida)

#### BOROUGH OF CHATHAM V. BOARD OF CON-SERVATION AND DEVELOPMENT (APPLICA-TION FOR ADDITIONAL WATER SUPPLY). 147 A. 720-721 (N.J. 1929).

Descriptors: \*New Jersey, \*Administrative agencies, \*Water supply, \*Adjudication procedure, \*Water sources, Legislation, Judicial decisions, Legal aspects, Rivers, Wells, Cities, Watercourses (Legal), Plans, Maps, Competing uses, Municipal water, Groundwater, Water demand.

Plaintiff borough sought to overturn defendant board of conservation and development's order granting a municipality permission to obtain additional water supplies within the borough. Plaintiff contended defendant's order failed to meet statutory requirements relating to administrative procedures. Plaintiff further asserted that defendant's approval was not supported by the evidence. The Supreme Court of New Jersey held that a municipality's application for additional water supplies need only state estimates of the quantity of water obtained from underground sources. The court affirmed defendant's order ruling that reasonableness, legality, and form of defendant's proceedings were the only proper questions for review. Questions concerning necessity of the use and injuries to other interests were deemed improper for review. (Duss-Florida)

#### CITY OF DOTHAN V. THOMLEY (LIABILITY FOR DIVERSION OF SURFACE RUNOFF). 127 So. 193-194 (Ala 1930).

Descriptors: \*Alabama, \*Cities, \*Surface runoff, \*Assessments, Taxes evaluation, Value, Adjudication procedure, Surface waters, Roads, Drains, Drainage, Local governments, Remedies.

Defendant property owner appealed a special benefit assessment levied by plaintiff city for paying streets and building curbs and gutters. The assessment was directly proportional to the increased property values resulting from improvements. Defendant contended the value of his property had not been increased, but rather diminished, because the improvements diverted the natural flow of surface water causing an increased volume of it to flow onto defendant's land. Plaintiff contended a jury instruction that defendant was not entitled to damages if the construction did not alter the natural flow of surface waters, was erroneous. The Supreme Court of Alabama observed that a municipality is not liable for injury from surface waters unless it diverts the

natural flow of such waters. The court, however, sustained the charge and affirmed the lower court's decision for defendant property owner. (Hart-Florida) W72-05779

BROCKETT V. CITY OF SHREVEPORT (LACHES PREVENTS LANDOWNER FROM ENJOINING CITY FROM BUILDING A RESER-106 So. 710-711 (La 1926).

Descriptors: \*Louisiana, \*Reservoirs, \*Cities, \*Flooding, \*Adjudication procedure, Dams, Flood damages, Legal aspects, Judicial decisions, Local governments.

Plaintiff littoral landowner sought to enjoin defendant municipality from establishing a reservoir by damming a lake. Through legislation, defendant acquired title to the bed of the lake. Defendant then began clearing the old lake bed including the lands which plaintiff claimed, and damming the lake to create a reservoir. Bonds were issued to fund the work. Plaintiff commenced the action two years after the work began. The Louisiana Supreme Court held that plaintiff was barred by laches from obtaining an equitable injunction. Nevertheless, the court noted that plaintiff might still seek damages, in an action at law, for the flooding of her lands. (Hart-Florida) W72-05780

FABRE V. BD. OF COMM'RS. OF ORLEANS LEVEE DIST. (LIABILITY OF LEVEE DISTRICT FOR FLOOD DAMAGE FROM INTENTIONAL BREAKING OF LEVEE).
170 La. 210, 127 Sc. 603-604 (1930).

Descriptors: \*Louisiana, \*Levees, \*Flooding, \*Flood damage, Dams, Eminent domain, Compensation, Profit, Fish, Damages, Local governments, State governments, Relative rights.

Identifiers: \*Constitutionality.

Plaintiff fish broker sought to recover damages from defendant levee district board of commissioners for loss of profits when defendant constructed an artificial crevasse in the levee protecting the island where plaintiff conducted his business. Plaintiff contended defendant's actions resulted in an unconstitutional taking without compensation. Another Louisiana constitutional provision, however, authorized the expropriation of property without reparation. The Supreme Court of Louisiana held defendant not liable to plaintiff for damages because there would be no obligation power of expropriation. (Hart-Florida) W72-05781 to make reparation if the state had acted under its

STATE EX REL. NORWOOD V. RUST LAND AND LUMBER CO. (TITLE TO ISLANDS IN MISSISSIPPI RIVER).

51 F.2d 555-557 (E.D. Ark 1931).

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of

Descriptors: \*Mississippi River, \*Islands, \*Accretion (Legal aspects), \*Land tenure, Real property, Boundary disputes, State governments, Administrative agencies, Administrative decisions, Channels, Rivers, Navigable rivers, Relative rights, Legislation, Judicial decisions.

Plaintiff state brought action to quiet title to Mississippi River. Defendant lumber company claimed title under the Islands Act, through which plaintiff had conveyed the islands to defendant. Plaintiff contended that the Islands Act was repealed and that, therefore, its conveyance was ultra vires. However, the court noted that the Arkansas supreme court had held that the Islands Act was in force. It was found that the disputed lands were either islands or accretions to defendant's land on the shore. Since the Islands Act gave the state commissioner discretion to determine if the lands were islands, his determination that the lands were islands and the conveyance to defenand were islands and the conveyance to detend dant was held conclusive against plaintiff. Plain-tiff's contention that the islands were formed in the bed of a lake was rejected because evidence established that the islands were formed in a navigable stream. (Hart-Florida)

WILLIAMSON V. CHICAGO MILL AND LUMBER CO. (TITLE TO ISLANDS IN MISSIS-SIPPI RIVER). 51 F.2d 551-552 (E.D. Ark 1931).

Descriptors: \*Mississippi River, \*Islands, \*Accretion (Legal aspects), \*Land tenure, Real property, Channels, Boundaries (Property), Boundary disputes, Legal aspects, Judicial decisions, Navigable rivers, Rivers, Taxes.

Plaintiff islandowner sued to quiet title to two islands in the Mississippi River. Defendant owned land on the shore and claimed the islands through accretion. Defendant also contended that he had acquired title by paying taxes on the islands. Plain-tiff claimed title by conveyance from the state. The court found that the disputed lands were not accretions to defendant's land. Since the islands therefore belonged to the state, the county was without authority to place them on the tax records. Therefore, the court held that defendant had not acquired title by paying taxes. (Hart-Florida) W72-05783

MILLER V. MILLER (PROPERTY RIGHTS IN FISHING BOATING, AND BATHING PRIVILEGES).

179 A. 248-251 (Pa 1935).

Descriptors: \*Pennsylvania, \*Swimming, \*Fishing, \*Boating, \*Prescriptive rights, Lakes, Dams, Backwater, Judicial decisions, Legal aspects, Recreation, Recreation demand.

In a suit for an accounting of partnership assets, the Pennsylvania superior court stated that since fishing and boating rights derived from corporeal rights, they were incorporeal hereditaments. The court ruled that title to an incorporeal right, such as fishing, boating, and bathing privileges, can not be acquired by prescription. (Hart-Florida) W72-05784

ROCHESTER V. BARNEY (APPORTIONMENT OF SUBMERGED LANDS). 169 A. 45-48 (Conn 1933).

Descriptors: \*Connecticut, \*Ownership of beds, \*Riparian rights, \*Shores, Beds, Beds under Pescriptors: "Connecticity, "Ownership of beds, Riparian rights, "Shores, Beds, Beds under water, Riparian land, Boundaries (Property), Boundary disputes, Land tenure, Real property, Intertidal areas, Mud flats, High water mark, Low water mark, Docks, Judicial decisions, Legal aspects.

Plaintiff riparian landowner sought to determine the respective riparian rights of himself and defen-dant riparian landowner. Plaintiff owned two lots on the inside of a cove, contiguous to a peninsula at the cove entrance owned by defendant. Defendant attempted to fill in behind a line between the end of his peninsula and the mutual boundary with plaintiff. Defendant objected to the trial court's apportionment of the submerged lands, contend-ing that it was disproportionate to their respective shorelines. The court noted that: (1) a riparian owner has wharfing rights and right of access to navigable waters distinct from public right of access, but a riparian cannot obstruct navigation; (2) riparian rights must be exercised with regard for corresponding rights; (3) submerged lands should be apportioned proportionately to the shoreline; (4) the extended boundaries of a straight shoreline must be parallel; (5) the extended boundaries of a convex shoreline diverge from the shore; and (6) the boundaries of a concave shoreline converge

from it. Observing that no rule was applicable to all situations, the court determined that the lower court's apportionment deprived defendant of riparian access from one side of his peninsula. The lower decision was, therefore, reversed. (Hart-W72-05785

LEAKY LEGISLATION: AN ANTIPOLLUTION PLAN CONTAINS A BIG LOOPHOLE FAVOR-ING OIL COMPANIES, Wall Street Journal, New York.

Wall Street Journal, January 7, 1972, p 1, col. 6.

Descriptors: \*Groundwater, \*Injection wells, \*Water pollution control, \*Political constraints, Oil wastes, Brine disposal, Legal aspects, Federal government, State governments, Legislation, Permits, Inspection, Regulation, Water utilization, Water Quality Act, Water sources, Oil industry, Secondary recovery (Oil), Water pollution sources, Oil wells, Waste disposal, Self-purifica-

Identifiers: \*Water Pollution Control Act.

Pending amendments to the Federal Water Pollution Control Act, which are expected to be ap-proved, would exempt materials injected into cer-tain oil and gas wells from the definition of a pollutant. The exemption is based on the presumption that state law presently provides effective regulation of injection wells through a system of permits and inspections. Gas, water, and chemicals are injected into the ground to force oil to the surface and dry wells are used for disposal of brine wastes. Environmentalists contend that these operations risk polluting the groundwater. Once polluted, ground water is very slow to cleanse itself because of the slowness of its movement and the lack of certain organisms to aid the cleansing process. The importance of groundwater--20% of the Nation depends upon it-has led Congress to try to protect this resource and control the disposal of pollutants in wells. Oil interests, however, appear to have managed to exempt their activities, while other industries with waste-injection wells would be subject to federal control. (Johnson-Florida) W72-05786

HOW TO CONDUCT A STATE INVENTORY, Minnesota Pollution Control Agency, Minneapolis. For primary bibliographic entry see Field 05G. W72-05815

HOW TO CONDUCT A STATE INVENTORY, Colorado Dept. of Health, Denver. Water Pollu-tion Control Commission. For primary bibliographic entry see Field 05G. W72-05816

THE KANSAS ANIMAL WASTE CONTROL PROGRAM, Kansas State Dept. of Health, Topeka. Environ-

mental Health Services. For primary bibliographic entry see Field 05G. W72-05817

MINNESOTA FEEDLOT POLLUTION CONTROL PROGRAM -- STATUS REPORT, Minnesota Pollution Control Agency, Minneapolis. For primary bibliographic entry see Field 05G. W72-05822

STATUS, PLANS, AND NEEDS FOR A COM-PREHENSIVE FEEDLOT POLLUTION CON-TROL PROGRAM IN SOUTH DAKOTA, South Dakota State Dept. of Health, Pierre. Water Pollution Control Section. For primary bibliographic entry see Field 05G.

### Field 06—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

STATUS REPORT OF MONTANA'S PROGRAM TO CONTROL POLLUTION FROM ANIMAL

Montana State Dept. of Health, Helena. Water Pollution Control Section.

For primary bibliographic entry see Field 05G. W72-05824

MISSOURI'S ANIMAL WASTE MANAGE-

Missouri Water Pollution Board, Jefferson City. For primary bibliographic entry see Field 05G. W72-05825

STATUS REPORT - KANSAS FEEDLOT POL-LUTION CONTROL PROGRAM - EXTEM-PORANEOUS REMARKS, Kansas State Dept. of Health, Topeka. Environ-

mental Health Services.

For primary bibliographic entry see Field 05G. W72-05826

STATUS REPORT - NEBRASKA FEEDLOT POLLUTION CONTROL PROGRAM, Nebraska Water Pollution Control Council, Lin-

For primary bibliographic entry see Field 05G. W72-05827

STATUS OF NORTH DAKOTA'S PROGRAM TO CONTROL POLLUTION FROM ANIMAL

North Dakota State Dept. of Health, Bismarck. Div. of Water Supply and Pollution Control. For primary bibliographic entry see Field 05G.

COLORADO'S STATEMENT, STATUS, PLANS, AND NEEDS FOR A COMPREHENSIVE FEEDLOT POLLUTION CONTROL PROGRAM, Colorado State Dept. of Public Health, Denver. Pollution Control Div. For primary bibliographic entry see Field 05G. W72-05829

FEEDLOT POLLUTION CONTROL IN IOWA, Iowa State Dept. of Health, Des Moines. Environmental Engineering Service. For primary bibliographic entry see Field 05G. W72-05830

A RECOMMENDED PROCEDURE FOR DEVELOPING A MODEL FEEDLOT REGULA-

TION, South Dakota School of Mines and Technology, Rapid City.

For primary bibliographic entry see Field 05G. W72-05834

AN ANALYSIS OF THE ECONOMIC IMPLICA-TIONS OF THE PERMIT SYSTEM OF WATER

ALLOCATION, Iowa State Water Resources Research Inst., Ames. For primary bibliographic entry see Field 06B.

W72-05839

THE POLITICS OF WATER SUPPLY IN NORTHERN NEW JERSEY, Rutgers - The State Univ., New Brunswick, N.J.

Water Resources Research Inst.

Available from the National Technical Informa-tion Service as PB-207 478, \$3.00 in paper copy, \$0.95 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, N.J., 227 p, Nov. 1971, 1 fig. OWRR A-029-N.J. (1).

Descriptors: \*Local government, \*Political aspects, \*Water distribution, \*Water resources development, \*Water supply, Jurisdiction, State

overnments, Water contracts, Water transfer, Water delivery, Water districts, Water policy, \*New Jersey, \*Decision making.

The agencies and interests involved in water supply in the Northern New Jersey metropolitan on are discussed, and the capacity of each to influence relevant public decisions. The ability of individual interests to block major action by withholding their cooperation in a highly frag-mented decision-making process severely im-paired the potential coordinative role of state government and other area-wide entities. A key factor here was the strong tradition of local autonomy in New Jersey. Among the water agencies, the large private water companies, despite their handicaps, appeared better able to expand their systems, because of their freedom from control by taxpaying voters, the ability to transcent local boundaries without threatening municipal autonomy, and incentives not possessed by governmentally-owned water agencies. Among water con-sumers, large industrial users were most influential, best organized and most adept at making their needs known to decision-makers. (Whipple-Rutgers) W72-05871

INTEREST GROUPS WITH WATER AND RE-LATED LAND RESOURCES PROGRAMS IN MINNESOTA, 1971, Minnesota Univ., Minneapolis. Water Resources

Research Center.

W. C. Walton, and David L. Hills. Available from the National Technical Information Service as PB-207 475, \$3.00 in paper copy, \$0.95 in microfiche. Bulletin 45, February 1971. 96 p. OWRR A-021-MINN (5).

Descriptors: \*Interest groups, Water resources development, \*Lobbying, State government, \*Minnesota, Policy, Attitudes, Resource agencies, Issues, Ecology, Land use, Water utilization. Identifiers: \*Citizen participation, \*Viewpoints, \*Associations, Environmental.

In 1971, there were at least 49 Interest groups in Minnesota with major water and related land resources programs, 4 Leagues and Associations with minor water and related land resources programs, at least 80 organizations that tend to ha continuing interest in water and related land resources issues, and at least 150 National organizations concerned with water and related land resources programs which have or could have members in the State. Of the 53 Interest groups (49 Interest groups and 4 Leagues and Associations mentioned above), 40 were conservation-preserva-tion oriented. 8 had the word environmental in their name, and 5 were development and management oriented. Taking into consideration multiple memberships, it is estimated that approximately 25,000 citizens in Minnesota were members of the 53 Interest groups in 1971. Membership in individual Interest groups ranged from 13 to 12,000. Expenditures in 1971 for water and related land resources programs of the 53 Interest groups probably totaled in excess of \$250,000. It is estimated that the number of water and related land resources Interest groups increased from about 16 in 1950 to 25 in 1960 to 33 in 1965 to 53 in 1971. W72-05878

### 6F. Nonstructural Alternatives

DREDGING, FILLING AND FLOOD PLAIN REGULATION IN MICHIGAN, Wayne State Univ., Detroit, Mich. For primary bibliographic entry see Field 06E.

BIAS IN COMPUTED FLOOD RISK, Geological Survey, Arlington, Va. C. H. Hardison, and M. E. Jennings.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY3, Paper 8766, ; 415-427, March 1972. 3 fig, 5 tab, 9 ref, ap-

Descriptors: Flood plain insurance, \*Floods, \*Frequency analysis, \*Probability, Flood plain zoning, Peak discharge, Cost-benefit ratio, Flood control. Identifiers: Flood frequency, \*Flood risk.

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Flood damage computed from flood-frequency curves fitted mathematically to observed annual peak flows or estimated by regression with basin characteristics, is a biased estimator of flood risk. The inaccuracy inherent in any flood-frequency curve increases the annual premium that would have to be charged to break even over a large number of projects. For ungaged sites where the population of annual peaks can be assumed to follow a log-Pearson Type III distribution, the true risk is evaluated by relating it to the standard error of estimate of the regression used to define the flood-frequency curve. In view of this relation between bias and error, the accuracy of all procedures used in evaluating flood frequency should be appraised in terms of standard error so that the proper flood risk can be obtained. (Knapp-USGS) W72-05645

6G. Ecologic Impact of Water Development

ENVIRONMENTAL QUALITY: THE SECOND ANNUAL REPORT OF THE COUNCIL ON EN-VIRONMENTAL QUALITY, AUGUST 1971. Council on Environmental Quality, Washington, D.C.

For primary bibliographic entry see Field 05G. W72-05520

ENVIRONMENTAL LAW: ECOLOGY HELD VALID CRITERION FOR DENYING DREDGE AND FILL PERMIT UNDER SECTION 10, RIVERS AND HARBORS ACT OF 1899.
For primary bibliographic entry see Field 05G. W72-05529

ECONOMIC GROWTH AND ECOLOGY--AN ECONOMIST'S VIEW,
Minnesota Univ., Minneapolis. Dept. of For primary bibliographic entry see Field 06C. W72-05665

### 07. RESOURCES DATA

### 7A. Network Design

SNOW MEASUREMENT PREDICAMENT, National Oceanic and Atmospheric Administra-tion, Silver Spring, Md. Hydrologic Research and Development Lab. For primary bibliographic entry see Field 02C. W72-05335

WEIGHT CAPACITY REQUIREMENTS FOR PRECIPITATION MEASUREMENTS IN THE WASATCH MOUNTAINS, Utah Water Research Lab., Logan.

For primary bibliographic entry see Field 02B. W72-05336

PRECIPITATION TELEMETRY IN MOUN-TAINOUS AREAS,

Utah Water Research Lab., Logan. For primary bibliographic entry see Field 02B.

### **RESOURCES DATA—Field 07**

### Data Acquisition—Group 7B

OPTIMUM GAGING OF THUNDERSTORM PAINFALL IN SOUTHEASTERN ARIZONA,
Agricultural Research Service, Tucson, Ariz. Agricultural Research Service, Tucs Southwest Watershed Research Center. For primary bibliographic entry see Field 02B.

IMPORTANT CONSIDERATIONS IN THE PROCESS OF DESIGNING A GROUNDWATER DATA COLLECTION PROGRAM, Geological Survey, Washington, D.C. Water Resources Div.

J. J. Hickey.

Water Resources Research, Vol 8, No 1, p 178-181, February 1972. 1 fig, 1 ref.

Descriptors: \*Data collections, \*Hydrologic data, \*Groundwater, Hydrogeology, Model studies, Mathematical models, Water quality, Groundwater movement, Hydrologic budget, Water Identifiers: \*Groundwater data.

Three important considerations in designing a groundwater data collection program are (1) a clear understanding of the activities needed to solve a general groundwater management problem, (2) an explicit classification scheme for the physical and water quality models of a groundwater system, and (3) an understanding of the con-cept of accuracy and its use in the design of a pro-gram. A classification scheme for the physical and water quality models of a groundwater system is proposed. The scheme is based on three types of physical models: (1) aquifer, (2) water budget, and (3) hydrodynamic; on three types of water quality models: (1) energy and chemical mass characteristics, (2) energy and chemical mass balance, and (3) energy and chemical mass transport; and on three types of model representations applicable to each physical and water quality model: (1) descriptive, (2) empirical, and (3) mathematical. (Knapp-USGS) W72-05341

PROPOSED CRITERIA FOR DESIGN OF A DATA COLLECTION SYSTEM FOR GROUND-WATER HYDROLOGY IN CALIFORNIA, 1970-

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02F. W72-05343

CRITERIA FOR GROUNDWATER LEVEL MODELING PURPOSES, California State Dept. of Water Resources, Sacra-

H. J. Peters. Water Resources Research, Vol 8, No 1, p 194-200, February 1972. 1 fig, 2 tab, 4 ref.

Descriptors: \*Data collections, \*Hydrologic data, \*California, \*Groundwater, Hydrogeology, In-strumentation, Planning, Water management (Ap-plied), Mathematical models, Model studies, Systems analysis.

Identifiers: \*Groundwater data.

Budget and technical considerations require the formulation of specific criteria in designing water level data networks that are to be measured over a long time period. Specific purposes or uses of longtime water levels relate to various intensities of hydrologic studies. Specific criteria are given in terms of measurement frequency and observation point density for purposes of storage and storage fluctuation for five intensities of hydrologic investigations. Each is related to needed geologic detail. The lead time for data collection varies from 1 to 15 years, depending on the intensity of the study and the resulting decision type. Applica-tion of the criteria in California's groundwater basins confirms the utility of the concept, but identifies the need for a definition of accuracies of contour maps constructed from various point densities and other study input, for close control of

measurement points, for broad judgment at boundaries, and for specifications of needed accuracy of interpreted information by users. (Knapp-USGS) W72-05344

DEFINITION OF HYDROLOGIC UNITS FOR WATER STUDIES IN ARKANSAS, Geological Survey, Little Rock, Ark. For primary bibliographic entry see Field 02F.

AN APPROACH TO THE DESIGN OF STATE-WIDE OR REGIONAL GROUNDWATER INFORMATION SYSTEMS, Geological Survey, St. Paul, Minn. Water Resources Div. For primary bibliographic entry see Field 02F.

INTERIM DATA ACQUISITION SYSTEM FOR THE ENVIRONMENTAL TEST LABORATORY, Johns Hopkins Univ., Silver Spring, Md. Applied Physics Lab. For primary bibliographic entry see Field 07C. W72-05442

SCIENTIFIC FRAMEWORK OF WORLD WATER BALANCE. For primary bibliographic entry see Field 02A. W72-05650

EMBUDO, NEW MEXICO, BIRTHPLACE OF SYSTEMATIC STREAM GAGING, Geological Survey, Washington, D.C. A. H. Frazier, and W. Heckler.

Available from GPO, Washington, DC 20402 -Price 45 cents, (paper cover). Geological Survey Professional Paper 778, 1972. 23 p, 20 fig, 10 ref.

Descriptors: \*Stream gages, \*Gaging stations, \*History, \*Documentation, \*New Mexico, Biographies, Reviews, Streamflow, Flow measurement, Flow rates, Current meters, Design. Identifiers: \*U.S. Geological Survey, First stream gages, Embudo (N Mex).

Embudo, a village on the Rio Grande in northern New Mexico, was chosen in 1888 to be the site of a training center for the first hydrographers of the Irrigation Survey, a new Bureau that had just been added to the U.S. Geological Survey under John Wesley Powell. The story of that center is presented including a prolog of the circumstances which led to the center's organization and an epilog of some of the distressing events which took place after the training period was completed. The story relates how the Geological Survey became involved in the art of stream gaging and how Powell was prevented from carrying out his plan for irrigation in the arid region-a plan which was largely adopted when Congress later established the Reclamation Service and the U.S. Bureau of Reclamation. (Woodard-USGS)

### 7B. Data Acquisition

MIGRATIONS OF ADULT KING SALMON ON-CORHYNCHUS TSHAWYTSCHA IN THE SAN JOAQUIN DELTA AS DEMONSTRATED BY THE USE OF SONIC TAGS, Richard J. Hallock, Robert F. Elwell, and Donald

H. Fry, Jr.

Calif Dep Fish Game Fish Bull. 151: 8-92. 1970. Il-

lus. Map. Identifiers: Adult, Block, California, Delta, King, Migrations, Oncorhynchus-Tshawytscha, Ox-ygen, Pollution, Salmon, San-Joaquin, Sonic, Tags, Temperature. Each fall, O. tshawytscha, bound for the Sacramento and San Joaquin River systems, pass through the Sacramento-San Joaquin Delta. Starting in 1961, salmon runs of the San Joaquin, but not of the Sacramento, suffered a disastrous collapse, probably due to water conditions in the San Joaquin part of the Delta. A partial recovery started in 1964. An annually recurring O2 block caused by pollution in the southeastern part of the Delta, plus reversal of direction of flow in all 3 major north-south channels of the San Joaquin (southern) part of the Delta, were believed responsible for the collapse. In the eastern channel, flow reversal which lasts into the salmon migration period occurs only in exceptionally dry falls such as 1961; in the other channels it occurs annually. Reversal is caused by operation of a 4600 cfs (cubic ft./sec) capacity pumping plant which pulls Sacramento River water south through channels that normally carry San Joaquin water north. From 1964 through 1967, salmon tagged with sonic tags by through 1907, samon tagged with sonic tags were released in the central part of the Delta to determine their reaction to low 02 levels and reversed flows. Electronic equipment enabled scientists to follow tags by boat and to record their movement past fixed points. Salmon avoided to the contraction of the contrac water with less than 5 ppm dissolved O2 by staying farther downstream until the O2 block cleared. Temperatures over 66 deg. F. had a similar but less sharply defined effect. In 1964, pumped water and partial closure of 1 major west-flowing channel were used to force extra water through the polluted area and break up the O2 block. At present pumping rates, this method is practical in dry years, but is not needed in normal or wet years. Relatively few fish used either of 2 western channels which had reversed flows but would have led them to their destination. The pattern of salmon movement is complicated by a large flow of Sacra-mento River water which diverts through the Delta Cross Channel and Georgiana Slough and flows successively through the Mokelumne and San Joaquin Rivers and back into the Sacramento. Some Sacramento salmon go upstream by this route. A 2nd large pumping plant (10,000 cfs capacity) has recently been completed, and will greatly increase flow reversal problems until a closed canal system (such as the proposed Peripheral Canal) is used to conduct Sacramento River water to the 2 large pumping plants.—Copyright 1971, Biological Abstracts, Inc.

PSYCHROMETRIC TECHNIQUES FOR MEASURING SOIL WATER POTENTIAL.

Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). B. G. Richards.

Division of Soil Mechanics Technical Report No 9, Commonwealth Science Industry Research Organization, Melbourne, Australia, 1969. 32p, 16fig, 4 plate, 16 ref, 3 append.

Descriptors: \*Soil water, \*Soil suction, Soil engineering, \*Soil investigations, \*Soil mechanics, Bibliographies, Laboratory equipment, Triaxial tests, Instrumentation. Identifiers: Australia, \*Psychrometrics, Probes, In

situ tests, Thermistors, Thermocouples.

The psychrometric techniques described permit the measurement of soil water potential in partially saturated soils from 0 to 1500 psi, with simplicity and accuracy not previously available. A laborato-ry instrument is described which has an accuracy of plus or minus 2.5 psi or plus or minus 5%. A modified version of this instrument permits the continuous measurement of potential during a triaxial cell test with an accuracy of plus or minus 5 psi or plus or minus 10%. Progress in the development of a portable psychrometer and sensing probes for in situ measurements is described (USBR) W72-05286

WATER SAMPLING APPARATUS,

Department of the Navy, Washington, D. C. (As-

### Field 07—RESOURCES DATA

### Group 7B—Data Acquisition

M. L. Greene. U. S. Patent No. 3,625,066, 7 p, 5 fig, 3 ref. Official Gazette, Vol. 893, No. 1, p. 68, December 7, 1971.

Descriptors: \*Patents, \*Sampling, Water properties, Oceanography, Hydrologic data, Nansen bottles.

Identifiers: \*Water sampling instruments, Hydrologic instruments, Oceanographic instru-

A device collects samples of sea water at various depths of the ocean upon a signal from a surface depths of the ocean upon a signal riom a sulface vessel. It includes a standard Nansen bottle to which is clamped a mounting block which swivelingly supports a bar, transversely bored to guide a slide rod. The slide rod is attached to the guide a side rod. The since rod is attached to the upper valve lever of the Nansen bottle. Another rod connects the upper and lower valve levers so that the valves close together. When the device has been lowered to the required depth, a high voltage can be delivered to break the resistor. This action permits the latch to move under the in-fluence of its elastic bands out of latching position and releases the slide rod to move downward under the influence of its elastic bands. Downward movement of the slide rod closes both top and bottom valves of the Nansen bottle, trapping the water sample. (Sinha-OEIS) W72-05299

#### WATER SAMPLER DEVICE,

U.S. Patent No. 3,489,012, 7 p, 9 fig, 4 ref. Official Gazette Vol 870 No. 2, p 457, January 13, 1970.

Descriptors: \*Patent, \*Sampling, Chemical analysis, Hydrologic data, Oceanography, Water pro-

perties, Instruments. Identifiers: \*Wate \*Water sampling instruments, Hydrological instruments, Oceanographic instru-

A device collects samples of water at various depths of the ocean or any body of water. It con-sists of a cylindrical holder with a plurality of removably mounted open ended bottles. Each bottle has two plugs positioned adjacent the open ends of the bottle. Sealing the open ends is prevented by a lanyard. As the holder is lowered, an electrical tripping mechanism releases the lanyard at the desired depth, permitting the plugs to seal the ends of the bottle and trapping the collected water. (Sinha-OEIS) W72-05304

### WATER-SAMPLING DEVICE,

R. E. Kjellberg.
U. S. Patent No. 3,623,369, 3 p, 3 fig, 4 ref. Official Gazette, Vol. 892, No. 5, p. 1658, November 30,

Descriptors: \*Patents, \*Sampling, Chemical analysis, Hydrologic data, Water properties, Oceanography, Thermometers, Temperature, Water temperature, Measurement, Physical properties. Identifiers: \*Water sampling instruments, Identifiers: \*Water sampling instruments, Hydrologic instruments, \*Water temperature mea-

A device collects samples of water and measures its temperature simultaneously. It includes a vessel capable of being opened and closed by remote controlled valves, a thermometer, and a line for lowering the vessel to the desired depth. The piston of the actuating pump can be retained in the resition taken of the reason and the solution tracks. position taken after an evacuation stroke. A clos-ing valve works with the evacuation chamber, and the movable valve has an attachment for the line which can be opened by pulling the line. (Sinha-OFIS) W72-05312

FEASIBILITY OF THE METROPOLITAN WATER INTELLIGENCE SYSTEM, (INTEGRATED AUTOMATIC OPERATIONAL CONTROL CONTROL),

American Society of Civil Engineers, New York.

For primary bibliographic entry see Field 04A. W72-05328

SNOW MEASUREMENT PREDICAMENT, National Oceanic and Atmospheric Administra-tion, Silver Spring, Md. Hydrologic Research and Development Lab.

For primary bibliographic entry see Field 02C. W72-05335

CONSTRUCTION OF CALIBRATION GRAPHS FOR SOIL MOISTURE MEASUREMENTS BY
THE NEUTRON METHOD ON THE BASIS OF
COMPARED GRAVIMETRIC MEASUREMENTS IN THE FIELD,
Technische Universitaet, Munich (West Ger-

For primary bibliographic entry see Field 02G. W72-05376

EXPERIMENTAL HYDROPHYSICS OF SOILS. METHODS FOR THE DETERMINATION OF SOIL MOISTURE POTENTIAL AND ITS TRANSPORT COEFFICIENTS, For primary bibliographic entry see Field 02G. W72-05377

DETECTION OF OIL CONTAMINATION IN SEA WATER. VOLUME III: ENGINEERING EVALUATION AND IMPROVEMENT OF THE INFRARED OLEOMETER,

IIT Research Inst., Chicago, Ill. For primary bibliographic entry see Field 05A. W72-05422

TWO SIMPLE DURABLE EPIFAUNAL COL-LECTORS,

Laval Univ., Quebec. Departement de Biologie. For primary bibliographic entry see Field 05A. W72-05432

RUNOFF ANALYSIS BY ELECTRICAL CON-DUCTANCE OF WATER, Tokyo Univ. (Japan). Lab. of Irrigation and

Drainage. For primary bibliographic entry see Field 02E. W72-05478

NEW, SIMPLIFIED METHODS FOR METAL ANALYSIS, Environmental Protection Agency, Cincinnati,

Ohio. Div. of Water Hygiene.
For primary bibliographic entry see Field 05A.
W72-05493

PRELIMINARY TESTS ON A VORTEX SHEDDING CURRENT METER, National Ocean Survey, Rockville, Md.

For primary bibliographic entry see Field 08B. W72-05494

THE SYSTEM APPROACH TO SIGNAL CONDI-

TIONING, Edgerton, Germeshausen and Grier, Inc., Al-buquerque, N. Mex. buquerque, N W. R. Edgel.

IEEE Transactions on Instrumentation and Measurements, Vol. IM-20, No. 4, p 201-205, November 1971. 6 fig.

Descriptors: \*Instrumentation, \*Electronic equipment, \*Data transmission, Equipment, Data ment, \*Data transmission, Equipment, Data processing, Automation, Systems analysis. Identifiers: \*Signal conditioning, Recorders, Transducers, Systems design, Channel matching, Readout devices.

A complete highly flexible signal conditioning system for matching transducers to readout devices is described. This system differs from con-ventional systems in that all the components for a

matching channel are packaged and powered together in one mainframe that provides the intertogether in one mainframe that provides the interconnections. The system gains tremendous advantages in flexibility, space, heat production,
'connectorology,' and cost. Any matching channel
can be synthesized by combining appropriate
transfer functions. The system provides five types
of components that provide power supply, input,
preamplifier, processor, and dual output transfer
functions. In each category, the number of
transfer functions for which components can be
designed is limited only by the user's imagination.
By proper selection of components, the system
can be used to match a wide variety of transducers
and readout devices. The analysis and synthesis
techniques are applied to several commonly used techniques are applied to several commonly used matching systems as a means of indicating the flexibility of the system. (Little-Battelle) W72-05583

THE ELECTRON CAPTURE DETECTOR-A

NEW MODE OF OPERATION, Reading Univ. (England). R. J. Maggs, P. L. Joynes, A. J. Davies, and J. E. Lovelock.

Analytical Chemistry, Vol. 43, No. 14, p 1966-1971, December 1971. 5 fig, 3 tab, 12 ref.

Descriptors: \*Gas chromatography, Efficiencies,

Dieldrin, Instrumentation.

Identifiers: \*Electron capture detector, \*Pulse modulation, Detection limits.

The general properties of pulse modulated opera-tion of the electron capture detector have been studied and an established design has been evalu-ated. Evaluation of the system was carried out by assessing the detector performance with respect to linearity of response, noise level, and detection limit. The effects of set reference current, detector limit. The effects of set reference current, detector temperature, and flow rate on the detector performance were investigated using five percent methane in argon as the carrier gas. The results were compared with those obtained using other carrier gases. The detector current was held constant while the frequency of the applied pulses was varied. The response was estimated to be linear over a range of about 50,000 with a detection limit of about 0.00004 nanograms per milliliter of diel-drin (the test material). The detector behaved as a concentration rather than a mass sensitive device over a flow-rate range of 10-120 milliliters per minute. Sensitivity varied with carrier gas composition, with argon plus 5 percent methane being most sensitive and oxygen-free nitrogen being least sensitive. (Holoman-Battelle) W72-05590

SAMPLING IMPROVEMENTS IN ATOMIC AB-SORPTION SPECTROSCOPY, Perkin-Elmer Corp., Norwalk, Conn. For primary bibliographic entry see Field 05A. W72-05597

IN SITU MOLECULAR PROFILER: A QUANTITATIVE EVALUATION OF PERFORMANCE, National Marine Fisheries Service, Miami, Fla.

Tropical Atlantic Biological Lab. For primary bibliographic entry see Field 05A. W72-05602

A PEBBLE MEASURER FOR LABORATORY USE, GIVING A PUNCHED TAPE OUTPUT, The Nature Conservancy, Wareham (England). Furzebrook Research Station. For primary bibliographic entry see Field 02J. W72-05641

SIMULTANEOUS CYCLING OF PELTIER THERMOCOUPLE PSYCHROMETERS FOR RAPID WATER POTENTIAL MEASURE-

Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.

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### Evaluation, Processing and Publication—Group 7C

G. J. Hoffman, W. N. Herkelrath, and R. S. Austin.

Agronomy Journal, Vol 61, No 4, p 597-601, July-August 1969. 5 fig, 2 tab, 8 ref.

Descriptors: \*Instrumentation, \*Soil Moisture Meters, \*Soil Water, \*Hygrometry, Automation.
Identifiers: \*Thermocouple psychromet Identifiers: \*Thermocouple psychrometer scanner, \*Soil Water Potential, Leaf Water Poten-

An automatic system was built to record the output from Peltier-effect thermocouple psychrometers. The system consists of a scanner, capacitors, voltmeter, and a recorder. The scanner, built from inexpensive commercial components, is of solidstate circuitry and contains only one moving mechanism, a stepping relay. The system auto-matically reads and stores the initial emf, cools as many as six psychrometers simultaneously, reads and stores the final emf, and heats the measuring junction of the psychrometers. For a 30-second cooling period, six psychrometers can be read in 2 1/2 minutes. By adding a stepping relay, as many as 150 psychrometers can be read in an hour. The standard deviations for recorded calibration out-puts were to plus or minus 0.04 microgram/ v for soil and intact leaf thermocouple psychrometers. Under actual experimental conditions, the values obtained with the automatic system were as accurate as measurements made manually. (Skogerboe-Colorado State) W72-05701

INSTRUMENT FOR MEASURING SURFACE VELOCITY OF WATER-ROCK MUDFLOWS (O PRIBORE DLYA IZMERENIYA POVERKHNOSTNOY SKOROSTI VODOKAMENNYKH
SELEVYKH POTOKOV),
Moscow State Univ. (USSR). Problemnaya
Laboratoriya Snezhnykh Lavin i Selei.
I. Ya. Boyarskiy, A. Yu. Vlasov, and M. S.

Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 3, p 82-87, May-June 1970. 3 fig, 1 tab, 2 ref.

Descriptors: \*Instrumentation, \*Test procedures, Analytical techniques, \*Sedimentation, flows, Movement, Velocity, Floats, Laboratory tests, On-site tests. Identifiers: \*USSR, Gidroproyekt.

A float-type velocity meter was constructed at the Kazakh Branch of the All-Union Planning, Surveying and Scientific Research Institute (Gidroproyekt) to measure surface velocity of mudflows under field/laboratory conditions. The instrument is mounted on a bracket, gantry, or other structure above a natural or manmade mudflow channel. Mudflow velocity is determined by a float secured to a measuring thread with an auto-matic timer to record the time the thread begins and stops winding on a spinning reel. The instrument is switched on automatically by the mudflow itself, by a special triggering float and thread. The instrument was used to study manmade mudflows at the Lake Issyk test site of the Kazakh Branch of Gidroproyekt (1967) and during the Mama-Chuya Geological Prospecting Expedition. Except for minor adjustments, the instrument is a reliable and accurate means of studying manmade mudflows. (Josefson-USGS) W72-05858

PRESSURE PLATE APPARATUS FOR PLOTTING DELTA P ± F (W) CURVES BY VOLUMETRIC MEASUREMENT OF MOISTURE (PLASTINCHATYY PRESS DLYA SNYATIYA KRIVYKH DEL'TA P ± F (W) S OB-'YEMNOY REGISTRATSIYEY VLAZHNOSTI), Agrofizicheskii Nauchno-Issledovatelskii Institut,

Leningrad (USSR). V. M. Sirotkin, and B. N. Michurin.

Pochvovedeniye, No 6, p 112-116, June 1971. 1 fig,

Descriptors: \*Pressure measuring instruments, \*Test procedures, \*Analytical techniques, Sampling, Moisture content, Pressure, Quartz, Particle size. Identifiers: \*USSR, Hydrophysics.

A modified pressure plate apparatus was designed for finding the relationship of moisture content to both the moisture potential and differential moisture capacity in artificial soils made of dif-ferent-size grains of ground quartz glass. The apparatus operates in the pressure range from 0 to 1 atm. The amount of liquid flowing out of the sample is measured in a burette; the volumetric technique of measuring moisture makes it possible to plot the entire curve of the relationship delta p = f (W) on the same sample without having to disassemble the apparatus. (Josefson-USGS) W72-05864

### 7C. Evaluation, Processing and Publication

COMPUTER ANALYSIS OF WATER DISTRIBUTION SYSTEMS: PART I - FORMULA-TION OF EQUATIONS, Medical Univ. of South Carolina, Charleston.

Dept. of Biometry. For primary bibliographic entry see Field 04A. W72-05322

RAINFALL. INTENSITY-DURATION-FREQU-RAINFALL INTENSITY-DURA HOW-FREQUENCY RELATIONS FOR THE WASATCH MOUNTAINS OF NORTHERN UTAH, Forest Service (USDA) Ogden, Utah. Intermountain Forest and Range Experiment Station. For primary bibliographic entry see Field 02B. W72-05339

PRINCIPLES OF GROUNDWATER DATA

ACQUISITION, Department of Energy, Mines and Resources, Ottawa (Ontario). Computer Research Section. For primary bibliographic entry see Field 02F. W72-05342

THE ACCURACY OF GROUNDWATER CON-TOUR MAPS, California State Dept. of Water Resources, Sacra-

mento.

For primary bibliographic entry see Field 04B. W72-05345

ANALYSES OF SELECTED STATISTICAL METHODS FOR ESTIMATING GROUND-WATER WITHDRAWAL. Geological Survey, Denver, Colo. For primary bibliographic entry see Field 02F.

W72-05346

SURROGATE MODELING,

General Electric Co., Santa Barbara, Calif. TEM-

For primary bibliographic entry see Field 02F. W72-05347

DATA NEEDS FOR PREDICTING PROBLEMS CAUSED BY THE USE OF SUBSURFACE RESERVOIRS,
Geological Survey, Denver, Colo. Water

Resources Div. For primary bibliographic entry see Field 05B. W72-05350

SURFACE WATER SUPPLY OF THE UNITED STATES, 1960-65: PART 16. HAWAII AND OTHER PACIFIC AREAS.

Geological Survey, Washington, D.C.

Available from GPO, Washington, DC 20402, Price \$4.00. Geological Survey Water-Supply Paper 1937, 1971. 710 p, 1 fig, 1 plate.

Descriptors: "Surface waters, "Data collections, "Streamflow, "Water quality, "Hawaii, Stream gages, Lakes, Reservoirs, Stage-discharge relations, Low flow, Peak discharge.

Identifiers: Surface water records, Guam, Okinawa, Tertuila.

One of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes and reservoirs in the United States during the 1961-65 water years, this report covers Hawaii and other Pacific areas. The data generally comprise a sta-tion description and a table showing daily discharge and monthly and yearly discharges. Station descriptions give the location, drainage area, records available, type and history of gages, average discharge, extremes of discharge, and general remarks. Type of gage currently in use and datum of the gage above mean sea level, and a condensed history of the types, locations, and datums of previous gages used during the record period are listed. Conditions affecting natural flow and information on accuracy of records are noted. Tables give daily, average, and extreme discharges and yearly totals and peak discharges. (Myers-USGS). W72-05360

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 5 AND 6. HUD-SON BAY AND UPPER MISSISSIPPI RIVER BASINS, AND MISSOURI RIVER BASIN. Geological Survey, Washington, D.C.

Available from GPO, Washington, DC 20402-Price \$2.50, Stock No 2401-2025. Geological Survey Water-Supply Paper 2013, 1971. 585 p, 1 fig, 32 ref.

Descriptors: \*Water quality, \*Water analysis, \*Surface waters, \*Data collections, Mississippi River, Missouri River, Analytical techniques, Sediment transport, Sedimentation, Particle size, Water temperature, Streamflow, Flow measurement, Hydrologic data. Identifiers: Hudson Bay, Upper Mississippi River

basin, Missouri River basin.

Quality of water data for the Hudson Bay and Upper Mississippi River basins, and Missouri River basin are presented for the 1967 water year (October 1, 1966 to September 30, 1967). The Geological Survey maintained 202 stations on 119 streams for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 150 of these locations for chemical-quality studies. Samples were also collected less frequently at many other points. Water temperatures were measured continuously at 37 and daily at 77 stations. Quantities of suspended sediment are reported for 61 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 32 stations. The stream discharges reported in the tables are either daily discharges or discharges obtained at the time samples were collected. Discharges reported for composite samples are usually the average of daily mean discharges for the composite period. (Myers-USGS) W72-05415

INTERIM DATA ACQUISITION SYSTEM FOR THE ENVIRONMENTAL TEST LABORATORY, Johns Hopkins Univ., Silver Spring, Md. Applied C. R. Edwards.

IEEE Transactions on Instrumentation and Measurement, Vol IM-20, No 4, p 206-209, November 1971. 3 fig.

### Field 07—RESOURCES DATA

### Group 7C—Evaluation, Processing and Publication

Descriptors: \*Data processing, \*Data transmission, \*Automation, \*Instrumentation, \*Monitoring, Data storage and retrieval, Computers, Electrical equipment, Analog computers, Water tem-

Identifiers: \*Thermocouples.

The interim data acquisition system (IDAC) can scan 200 channels of analog data and 400 ther-mocouples under control of a programmable cal-culator. Time, day number, and test identification number are printed at the start of every record. Source and channel identification are formatted and printed with each line of data. The system includes several self-checks, tolerance checks, and a means to signal the operator in the event of a malfunction. The heart of the system is the programmable calculator, an HP-9100B, which has 35 storage registers, each of which can store a 12digit number with sign and decimal point. An HP-9101A extended memory provides 248 more registers of memory. The system includes a basic software library with the programs divided into data-acquisition and checkout programs. (Jefferis-Battelle) W72-05442

#### DIGITAL-TO-ANALOG CONVERTER SURVEY.

Instruments and Control Systems, Vol. 44, No. 1, p 89-95, November 1971, 4 ref.

Descriptors: \*Computers, Analog computers, Digital computers, Data processing, Data trans-

Identifiers: \*Digital to analog converters.

Generalized information on the types of digital-to-analog converters (DAC's) available and their principles of operation is presented as an introduc-tion to the survey. A table of definitions is also given. The survey contains information submitted by manufacturers of DACs and is intended to aid in the selection of these devices. Information is in-cluded on more than 50 devices. (Mortland-Battelle) W72-05585

A SYSTEMATIC STUDY OF THE QUANTITA-TIVE EFFECTS OF INSTRUMENT CONTROL ON ANALYTICAL PRECISION IN FLAME IONIZATION GAS CHROMATOGRAPHY. Coal Tar Research Association, Gomersal (England). For primary bibliographic entry see Field 02K.

BIAS IN COMPUTED FLOOD RISK, Geological Survey, Arlington, Va. For primary bibliographic entry see Field 06F. W72-05645

W72-05592

WATER RESOURCES OF WISCONSIN, CEN-TRAL WISCONSIN RIVER BASIN, Geological Survey, Washington, D.C. R. W. Devaul, and J. H. Green. For sale by USGS, Washington, D.C. 20242 - \$1.75 per set. Geological Survey Hydrologic Investiga-tions Atlas HA-367, 4 sheets, 1971. Text, 13 fig, 7 maps, 7 tab, 25 ref.

Descriptors: \*Water resources, \*Surface waters, \*Groundwater, \*Hydrogeology, \*Wisconsin, Water yield, Water quality, Aquifers, Aquifer characteristics, Geology, Hydrologic data, Hydrographs, Maps, Precipitation (Atmospheric), Streamflow, Stream gages, Flow rates, Water resources development. Identifiers: \*Wisconsin River Basin (Wis),

Hydrologic atlas.

This hydrologic atlas is suitable for use by waterresource planners and managers in the central Wisconsin River Basin. This basin is about 5.050 square miles in area, and extends about 110 miles south from Merrill to Wisconsin Dells. The basin includes all or parts of the following Wisconsin countries: Adams, Clark, Columbia, Jackson, Juneau, Langlade, Lincoln, Marathon, Marquette, Monroe, Portage, Sauk, Taylor, Waushara, and Wood. The water sources, uses, quality, interrelationships, availability, and behavior within the basin environment are described. The peak discharge expected on the average of once every 10 years is about 23,000 cfs for the Wisconsin River at Merrill. Groundwater in a large part of the sand plain, particularly near the Wisconsin River, is soft and low in dissolved solids. The area is a tremendous reservoir of potable and only slightly south from Merrill to Wisconsin Dells. The basin tremendous reservoir of potable and only slightly mineralized water. Groundwater ranges from hard to very hard along the eastern border of the basin and becomes softer toward the Wisconsin River. The concentration of dissolved solids in the Wisconsin River during the period 1963-64 ranged from 105 to 280 mg/liter at the Petenwell site and from 85 to 160 mg/liter at the Wausau site. (Woodard-USGS) W72-05653

A 'DISJOINTED INCREMENTALIST'S' AP-PROACH TO MEASURING RESEARCH BENEFITS AND COSTS, Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics. For primary bibliographic entry see Field 06B. W72-05672

WATER AVAILABILITY OF MARENGO COUNTY, ALABAMA, Geological Survey, Tuscaloosa, Ala. J. G. Newton, J. F. McCain, and A. L. Knight.

Alabama Geological Survey Map 98, 1971. 21 p, 3 fig, 1 map, 4 tab, 17 ref.

Descriptors: \*Water resources, \*Surface waters, \*Groundwater, \*Hydrologic data, \*Alabama, Data collections, Streamflow, Water wells, Water yield, Flow measurement, Water quality, Chemical analysis, Aquifer characteristics, Maps. Identifiers: Marengo County (Ala).

Large supplies of water are available for use in Marengo County, Alabama. Of the average annual rainfall of about 52 inches, 17 inches runs off as streamflow. Total runoff is 890,000 acre feet per year or an average of about 0.8 mgd per square mile. The principal sources of groundwater are the mile. The principal sources of groundwater are the Eutaw Formation in the northern part of the county and the Tuscahoma Sand and Nanafalia Formation in the southern part. The Eutaw will yield 1 mgd per well and the Tuscahoma and Nanafalia 0.1 to 0.5 mgd per well. In northwestern and south-central parts of the county, water in aquifers is highly mineralized, having a chloride content that exceeds 1,000 mg/l. The principal streams in the county are the Black Warrior and Tombigbee Rivers. At their junction in the northern part of the county, the average discharge of the Tombigbee is 7,800 mgd and the Black Warrior 6,270 mgd. Water in the streams is soft to moderately hard and generally has a dissolved solids content of less than 125 mg/l. (Woodard-USGS) W72-05842

WATER AVAILABILITY OF CLARKE COUN-TY, ALABAMA,

Geological Survey, Tuscaloosa, Ala. L. V. Causey, and J. F. McCain. Alabama Geological Survey Map 97, 1971. 34 p, 4 fig, 1 map, 5 tab, 25 ref.

Descriptors: \*Water resources, \*Surface waters, Groundwater, \*Hydrologic data, \*Alabama, Data collection, Streamflow, Water wells, Water yield, Flow measurement, Water quality, Aquifers, Maps, Aquifer characteristics, Water utilization, Chemical analysis. Identifiers: Clarke County (Ala).

Large supplies of surface water and groundwater are available for use in Clarke County, Alabama.

The major streams are the Alabama and Tombig-The major streams are the Alabama and Johnog-bee Rivers and the major aquifers are in the Nanafalia, Hatchetigbee, and Lisbon Formations, the Tuscahoma and Gosport Sands, and the Pliocene and Miocene Series. The average flow of Phocene and Muocene Series. The average flow of the Alabama and Tombigbee Rivers, where they enter Clarke County, is about 36,000 mgd. The average runoff originating in Clarke County is about 1,200 mgd or 0.95 mgd per square mile. Aquifers in several parts of the county will yield 0.5 to 1.0 mgd per well. There is an estimated 32 million acre-feet of removable groundwater with a dissolved solids content of 1,000 mg/l or less stored in aquifers underlying the county. Water in cussoived solids content of 1,000 mg/l or less stored in aquifers underlying the county. Water in streams is soft to moderately hard and low in dissolved solids. Water in aquifers tapped by wells generally contains less than 500 mg/l dissolved solids and ranges in temperature from 19 deg C at a depth of 200 feet to 23 deg C at a depth of 700 feet. (Woodard-USGS)
W72-05843

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR ESCONDIDO CREEK, SAN ANTONIO RIVER BASIN, TEX-

Geological Survey, Austin, Tex. Water Resources

Div. D. R. Reddy. Geological Survey Data Report, November 1971. 65 p, 2 fig, 3 tab.

Descriptors: \*Hydrologic data, \*Streamflow, \*Data collections, \*Rainfall-runoff relationships, \*Texas, Surface waters, Water storage, Storms, Levees, Hydrographs, Stream gages, Watersheds (Basins), Inflow, Discharge (Water). Identifiers: Escondido Creek Watershed (Tex), Water year 1970.

Rainfall, runoff, and storage data collected during the 1970 water year are presented for the 72.4-square-mile area above stream-gaging station Escondido Creek at Kenedy, Texas. There are 11 floodwater-retarding structures in the Escondido Creek watershed and all but one are upstream from the stream-gaging station. The 10 structures above the stream-gaging station have a combined total capacity of 14,060 acre-feet and control an area of 36.5 square miles, or 50 percent of the drainage area. The mean annual rainfall (1931-60) at Karnes City is 31.93 inches. The weighted-mean rainfall over the study area for the 1970 water year was 33.85 inches. Monthly rainfall ranged from 0.48 inch in April to 8.70 inches in May. Yearly mean discharge at the stream-gaging station was 9.61 cfs, compared with the 16-year (1955-70) average of 14.0 cfs. Annual runoff at the stream-gaging station was 6,960 acre-feet. For the 1970 water year three storms were selected for detailed computations. These computations include detailed time breakdown of rainfall and discharge. Hydrographs and mass curves are included. (Woodard-USGS) W72-05847

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR CALAVERAS CREEK, SAN ANTONIO RIVER BASIN, TEX-

Geological Survey, Austin, Tex. Water Resources

D. R. Reddy. Geological Survey Data Report, November 1971. 63 p, 2 fig, 3 tab.

Descriptors: \*Hydrologic data, \*Streamflow, \*Data collections, \*Rainfall-runoff relationships, \*Texas, Surface waters, Water storage, Inflow, Discharge (Water), Storms, Levees, Stream gages, Watersheds (Basins), Hydrographs. Identifiers: \*Calaveras Creek (Tex), Water year

Rainfall, runoff, and storage data collected during the 1970 water year are presented for the 77.2-square-mile area above the stream-gaging station

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Calaveras Creek near Elmendorf, Texas. There are 7 floodwater-retarding structures in the watershed. These structures have a capacity for temporary storage of 8,640 acre-feet of flood ru-noff from 26.6 of the 77.2-square-mile study area. not from 26.6 of the 17.2-square-mue study area. The mean rainfall in the study area for the 1970 water year was 29.64 inches. The average monthly rainfall totals ranged from 0.42 inch in June to 7.74 inches in May. Yearly mean discharge at the stream-gaging station, Calaveras Creek near Elmendorf, was 0.59 cfs. This shows the effect of Calaveras Dam on the basin as the average discharge for the 14 years (1955-68) was 10.7 cfs. For the 1970 water year, 6 storms were selected for detailed computations. The computations indischarge. Hydrographs and mass curves are in-cluded. (Woodard-USGS) W72-05848

THE STANFORD MODEL APPLIED TO PIED-MONT WATERSHEDS, Clemson Univ., South Carolina. Dept. of Agricul-

tural Engineering.
For primary bibliographic entry see Field 02A.
W72-05860

TRANSMISSION OF DIGITAL DATA, Geological Survey, Washington, D.C. C. R. Showen Geological Survey Open-file Report, November 1971. 13 p, 3 fig.

Descriptors: \*Remote sensing, \*Hydrologic data, \*Data processing, \*Telemetry, \*Data collections, Instrumentation, Methodology, Costs, Data transmission, Electronic equipment, Testing, Control systems, Computers, Computer programs. Identifiers: U. S. Geological Survey, Digital data.

The U. S. Geological Survey, Water Resources Division, established a pilot project to evaluate equipment that transmits data recorded on 16channel paper tapes over voice-grade telephone lines from field offices to the Washington, D. C., Automatic Data Processing Unit. The reader/transmitter is capable of transmitting data at a rate of 50 rows (200 binary coded decimal digits) per second. The receiver/recorder records the data on a 7-track magnetic tape, 1/2 inch wide, BCD, even parity, at a recording density of 200 bits per inch. The communications interface may be a Bell System 202E2 data set or equivalent. This device will accept serial data at rates up to 1200 bits per second. It is recommended that reader/transmitter units be installed at the Water Resources Division processing centers in Denver, Colorado, and St. Louis, Missouri. These reader/transmitter units would enable districts now required for processing of current-purpose data. (Woodard-USGS)
W72-05862 without terminals to reduce the turnaround time

### 08. ENGINEERING WORKS

### 8A. Structures

THE DESIGN OF AIR-CONTROLLED SPILL-WAY SIPHONS, Dundee Univ. (Scotland).

J. A. Charlton.

Journal of the Institution of Water Engineers, Vol 25, No 6, p 325-336, Aug 1971. 6 fig, 15 ref.

\*Siphons, Descriptors: \*Spillways. criteria, Stage-discharge relations, Performance, Discharge (Water), Model tests, Discharge coefficients, \*Hydraulic design, Bibliographies.
Identifiers: Great Britain, Priming.

The performance of a spillway siphon can be described by a stage-discharge curve or characteristic. A siphon can be designed to function as described by a desired characteristic. A well designed air-regulated siphon has a characteristic with a positive gradient throughout, no hysteresis, and is stable at all flows. The design is governed primarily by the desired characteristic giving the priming head, maximum flow, and the range of water level between these 2 limits. The concept of weir flow is used to design the lower requirement, while conduit flow principles determine the maximum flow. Between these limits the siphon is aircontrolled, preferably by taking in air through a free entry under the hood. The width of the hood is a significant factor in controlling the midsection gradient of the characteristic. The overall shape of the siphon and the priming system is governed by the local geographic features, whether the siphon has a sealed or free exit. A hydraulic model of the siphon design is recommended to verify that the siphon functions satisfactorily, to assist designing, and to determine the exact characteristic. (USBR) W72-05287

HYDRAULIC DESIGN OF SIDE-CHANNEL SPILLWAYS,

Surrey Univ., London (England).

W. D. Moss. Water and Water Engineering, Vol 75, No 906, p 302-307, Aug 1971. 4 fig 2 tab 5 ref.

Descriptors: \*Spillways, \*Hydraulic design, hydraulic, Design practices, Subcritical flow, Supercritical flow, Hydraulic properties, Computer applications, Calculations, Dams, Concrete dams,

Identifiers: Great Britain, \*Side channel spillways, Weir crests, Trapezoidal channels, \*Water sur-faces profiles.

Spillways for dams are often set at right angles to the axis of their discharge channels. When the topography will not permit this arrangement, the crest of the spillway can be set nearly parallel to the discharge channel. Such an arrangement is called a side channel spillway. The overflow weir is usually an uncontrolled type, but can be gated. The collecting channel can be designed independently of the remainder of the spillway, provided the water in the collecting channel does not submerge the crest, and the slope of the discharge channel is steep enough to eliminate any effect upstream. The hydraulic design procedure is: (1) assume as a trial design a trapezoidal cross section and a longitudinal section, (2) set an arbitrary datum for levels, and (3) calculate, using the principles described, the water surface profile. choice of the longitudinal profile is influenced by the type of flow desired: with a gentle slope and downstream control, the flow is subcritical throughout the collecting channel; with a steep slope, critical depth occurs at a point within the channel. Calculations of upstream and downstream depths proceed from this point. Numerical examples illustrating both types of flow are given. (USBR) W72-05288

### BREAKWATER STRUCTURE,

Societe Grenobloise d'Etudes et d'Applications Hydrauliques (France). Vincent.

U.S. Patent No. 3,490,239, 4 p, 2 fig, 8 ref. Official Gazette Vol 870 No. 3, p. 774, January 20, 1970.

Descriptors: \*Patents, \*Breakwaters, \*Shore protection, Engineering structures, Sea walls, Coastal structures, Erosion control, Ocean waves, Surges,

Identifiers: \*Mobile breakwaters.

An improved breakwater structure is capable of preventing surges of water from passing thereover. Two spaced walls exposed to wave attack are mounted on a breakwater having a sloping wall on the seaward side. The wall facing open water forms a deflector and divides the rising surge of water into two sheets; one is deflected, the other passes through the wall to the second

wall which throws the other sheet of water back onto the space between the two walls. The break-water structure is mobile, and is a caisson-like beam having means for temporarily anchoring it to the sea floor. (Sinha-OEIS) W72-05296

### WELL CONSTRUCTION REGULATION AND STANDARDS.

North Carolina Board of Water and Air Resources, Dep't. of Water and Air Resources, Raleigh, North Carolina, September 1971. 47 p, 7 fig, 1 tab, 11 ref, 5 append.

Descriptors: \*North Carolina, \*Well regulations, \*Construction, \*Pumps, \*Well permits, Standards, Water pollution control, Water supply, Potable water, Groundwater, Wells, Installation, Drilling, Chlorination, Well screens, Recharge wells, Oil wells, Irrigation wells, Logging (Recording), Caries, Well series, Series, Well series, Series, Well series, Series, Series, Well series, ing), Casings, Well spacing.

Under authority of the North Carolina Well Construction Act the Board of Water and Air Resources shall adopt rules and regulations governing the location, construction, repair, and abandonment of wells and the installation and repair of pumps and pumping equipment. The purpose of these regulations is to safeguard the state's ground-water reservoirs -its only remaining source of unpolluted fresh water. A person violating the regulations is subject to a penalty of \$100. Registration and permits are necessary for drilling, pump installation, well construction, and water use. Standards of construction for water supply wells apply to: (1) location, (2) source of water, (3) wells apply to: (1) focusion, (2) source of water, (3) drilling and casing, (4) grouting, (5) well screens, (6) gravel packed wells. (7) large diameter wells cased with concrete pipe, (8) well-head completion and equipment, and (9) well identification plates. Standards of construction for wells other than water supply include: (1) recharge and disposal wells; (2) test holes and borings; (3) mining, oil, and gas wells; and (4) elevator shafts. Regulations are provided for pumps and pumping equipment, the chlorination of wells, the maintenance and repair of wells, and abandonment of wells. Appendices pertain to forms, figures, and tables respecting well installation and maintenance. (Rees-Florida) W72-05525

PORT GROWTH POLICIES ABROAD, Little (Arthur D.), Inc., Cambridge, Mass For primary bibliographic entry see Field 06B. W72-05581

DRAINAGE CORRELATION RESEARCH PRO-JECT, (VOL. I.), Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 04A. W72-05795

DRAINAGE CORRELATION RESEARCH PRO-JECT, VOL. II, Montana State Univ., Bozeman. Dept. of Civil En-

gineering and Engineering Mechanics. For primary bibliographic entry see Field 04A.

### 8B. Hydraulics

CHANNEL PROCESSES DURING DIVERSION OF STREAMFLOW (RUSLOVYYE PROTSESSY PRI PEREBROSKE STOKA).

Gidrometeoizdat, Leningrad, 1970. 268 p.

Descriptors: \*Channel morphology, \*Channel flow, \*Streamflow, \*Diversion, Regulation, Flow rates, Turbulent flow, Soils, Sediment transport,

### Field 08-ENGINEERING WORKS

### **Group 8B—Hydraulics**

Sediment discharge, Channel erosion, Reservoir silting, Water management (Applied), Hydraulic engineering, Hydraulic structures, Conveyance structures, Canals, Water chemistry, Water quality, Turbidity.
Identifiers: \*European USSR, \*Caucasus, \*Cen-

tral Asia, Erodibility, Kinematics.

This monograph consisting of 6 chapters examines the basic characteristics of a channel regime during diversion of streamflow, the results of recent studies of canal and regulated river regimes, and the experience gained from planning and operating water management systems in the European USSR, Caucasus and Central Asia. Geomorphological, hydraulics, and statistical methods of estimating channel conveyances and sediment transport are accompanied by sample computations of critical flow velocities, bottom and suspended sediment discharge, and increasing turbidity in an erodible channel. Particular attention is given to the interaction of a stream and cohesive soil in typical irrigation canals and to the role of hydrochemical erosion in the degradation of a clay-filled channel and in the subsequent changes in water quality. Relationships which make it possible to evaluate evolution of general channel shapes, intensity of channel erosion, and reservoir silting are examined in the light of changes in channel capacity and methods of channel control. The text is intended for hydrologists engaged in a study of the effects of erosion on streamflow and sediment discharge and for hydraulic engineers concerned with the planning and operation of canals and regulated streams. (Josefson-USGS) W72-05357

WATER DISTRIBUTION SYSTEM FOR CANALS.

Societe Grenobloise d'Etude et d'Applications Hydrauliques (France) (Assignee). For primary bibliographic entry see Field 04A. W72-05429

PRELIMINARY TESTS ON A VORTEX SHEDDING CURRENT METER,

National Ocean Survey, Rockville, Md.

G. Appell.

National Oceanographic Instrumentation Center Technical Bulletin DE - 1002, p 5-7, December 1971. 4 fig.

Descriptors: \*Current meters, \*Stream gages, \*Streamflow, \*Flow measurement, Research and development, Instrumentation, Design, \*Testing, Discharge measurements.

When a cylindrical rod is placed crosswise to the direction of fluid flow, large eddies are regularly and alternately shed from opposite sides. These eddies are known as Karman vortex trails. The shedding frequency is directly proportional to the Stroubal number over certain Reynolds number ranges and is a function of the rod diameter and stream velocity. The principle was exploited in a deep water current speed meter in a prototype development. An acoustic signal was passed through the vortex street downstream from the shedding rod. This signal was amplitude modulated by the passage of the vortices and electronically detected and conditioned to produce a 10volt square wave which has the same frequency as the shedding vortices. Testing was conducted in the range of speeds between 0.19 and 11.79 fps. The resultant data were processed by sampling the measured frequency at 1-second intervals and averaging these samples for 10 seconds. The maximum deviation in data was obtained from the maximum and minimum frequency measured during a constant speed run. The results of these tests are summarized graphically. (Woodard-USGS) W72-05494

REPRESENTATION OF BED CONFIGURA-TIONS IN DEPTH-VELOCITY-SIZE DIA-GRAMS,

Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 02J. W72-05622

END EFFECTS IN MODELS FOR SEEPAGE

College of Engineering, Madras (India). S. Muthukumaran, and Kulandaiswamy. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY3, Paper 8794, p541-552, March 1972. 4 fig, 1 tab, 4 ref, Ap-

Descriptors: \*Seepage, \*Weirs, \*Underseepage, Flow nets, Alluvial channels, Permeability, Water

Identifiers: \*Seepage below weirs.

Determination of the seepage pattern beneath weirs on pervious foundations often requires model experiments. In these models the pervious reaches on the upstream and downstream sides can be reproduced only up to a short length while in the prototype these lengths are very large. If the length reproduced is small, considerable error is introduced in the values of uplift pressures determined by model experiments. By an analytical approach, the minimum length of pervious reach to be reproduced in the model, to keep down the error to a specified maximum, is determined and presented in a graph. (Knapp-USGS) W72-05624

FEATURES OF COARSE-GRAINED, HIGH-CO-NCENTRATION FLUIDS AND THEIR AND DEPOSITS, California Univ., Santa Barbara.

For primary bibliographic entry see Field 02J. W72-05628

SEDIMENT DISCHARGE COMPUTATION PROCEDURES, Department of the Environment, Ottawa (On-

tario). Inland Waters Branch. For primary bibliographic entry see Field 02J. W72-05642

SHEAR FLOW PAST CIRCULAR CYLINDER, Bristol Univ. (England). Dept. of Civil Engineer-

ing.
T. L. Shaw, and M. R. Starr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY3, Paper 8774, p 461-473, March 1972. 5 fig, 10 ref, append.

Descriptors: \*Turbulent flow, \*Flow around objects, \*Vortices, \*Boundary layers, Hydraulics, jects, \*Voi Shear drag. Identifiers: Flow around cylinders.

Few, if any, civil engineering structures exposed to wind or water flows are free of strong boundary-layer effects induced within the flow by the nearness of the ground. The velocity or shear gradient then acting on the structure provides marked three-dimensional flow patterns in the wake, changing the pressure distributions from those to be expected in two-dimensional conditions. This effect was computed for various shear gradients but always with the same boundary and structure geometry. Local vortex shedding is demonstrated, but structural oscillation is ex-cluded. (Knapp-USGS) W72-05643

DRAINAGE DESIGN AS INFLUENCED BY CONDITIONS IN THE VICINITY OF THE DRAIN LINE,

California Univ., Davis. Dept. of Water Science and Engineering. James N. Luthin.

California Water Resources Center Completion Report UCAL-WRC-W-212, February 1972, 2 p. OWRR A-031-CAL (2).

Descriptors: Tile drainage, Pipe segments, Gravel envelopes, Clay soils.

Effect of drain parameters on flow into drains was studied. Doubling the drain diameter gave a 90.130% increase. Decreasing pipe segment length from 3 ft to 1 ft increased rate of flow by more than 2 1/2 times for bare pipe (no gravel envelope). For pipe wrapped with fiberglass, the increase was about 50%. Studies on design of a gravel envelope found single-sized separates such as pea gravel not effective in preventing movement of fine sands and silts into drain lines. Gravel envelopes should not contain material smaller than a No. 40 sieve. Gravel envelopes containing appreciable amounts of particles between the No. 10 and No. 40 sieve will probably prevent movement of fine sands and silt. Particles larger than No. 10 apparently reduced the effectiveness of the envelope. Field soils containing clay and having good natural structure do not require an envelope. W72-05872

CHLORIDE CONTROL - ARKANSAS AND RED

RIVER BASINS, Army Engineer District, Tulsa, Okla. For primary bibliographic entry see Field 05G. W72-05876

### 8C. Hydraulic Machinery

SELECTION OF REVERSIBLE PUMP/TURBINE SPECIFIC SPEEDS, Allis-Chalmers Corp., York, Pa.

L. F. Henry. Paper, Allis-Chalmers, 1971. 7 p, 6 fig, 1 tab, 5 ref.

Descriptors: \*Pump turbines, Pumped storage, \*Hydraulic machinery, Design data, Cavitation, Machine design, Economics, Evaluation, Pumps, Velocity, Efficiencies, Operation and maintenance, Vibration. Identifiers: \*Reversible turbines, Generator-motors, Turbine efficiency, High head, Noise reduction, Cost savings, \*Specific speed.

To cope with the continually increasing demand for electric power, many utilities are using reversi-ble pump turbines to provide additional genera-tion. Studies must be made to select the most economical equipment for each plant. Since selec-tion of the pump turbine specific speed controls many economic considerations in the pumped storage plant, this is a subject of considerable in-terest and concern. The policy of one manufac-turer for making safe and controlled progress toward higher specific speeds for higher head, higher speed, larger capacity, and least expensive pump turbines is explained. Measured noise level data for various plants are presented. Data are tabulated on 28 pump turbine units showing how governing parameters were changed by methodical advancements in design and experience. Using higher specific speeds can mean a cost saving for pump turbine and generator-motor units, which will be smaller in size. However, efficiency, cavitation characteristics, and mechanical and hydraulic design features must also be evaluated nydraunc design reatures must also be evaluated before selecting the most favorable speed. The higher noise levels produced by higher capacity equipment should also be considered during design. (USBR) W72-05290

A STUDY OF CONTRAROTATING TURBINES BASED ON DESIGN EFFICIENCY, Dominion Engineering Works Ltd., Montreal

(Ouebec). C. Qzgur, and G. K. Nathan.

Transactions, American Society of Mechanical Engineers, Ser D--J Basic Engineering, Vol 93, No 3, p 395-404, Sept 1971. 13 fig, 5 ref, append.

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### Rock Mechanics and Geology—Group 8E

Descriptors: \*Hydraulic turbines, \*Hydraulic machinery, Cavitation, Turbine runners, Machine design, Design data, Axial flow turbines, In-vestigation, Kinetic energy. Identifiers: Canada, Specific speed, Turbine effi-

The concept of contrarotating turbomachinery, of-The concept of contrarotating turbomachinery, of-fering advantages over conventional systems such as higher efficiency, flatter characteristics, and better cavitation performance, is generating in-terest in the hydraulic machinery field. This study reveals the variation of optimum (or design) effi-ciency of contrarotating turbines with different parameters and compares these turbines with con-ventional axial turbines. Formulas are given which can be extended to investigate either an unequal speed machine or a turbine with a residual whirl at the outlet. The higher efficiency of the contrarotating turbine at high specific speed and low head coefficient makes it well suited for low head powerplants; it is also suitable for high head appli-cations. Efficiency considered in this study in-cludes blade losses only; however, the reduced ef-ficiency resultine forces and that bless in the ficiency resulting from gap and duct losses is com-pensated for by simplicity of water passages in contrarotating turbines. Recent test results justify assumptions made in this study and confirm the validity of the analysis. (USBR) W72-05291

UNDERGROUND TRANSMISSION IN THE

UNITED STATES,
Boston Edison Co., Mass; and Public Service
Electric and Gas Co., Newark, N.J.
A. F. Corry, and A. S. Brookes.
Underground Engineering, Vol 2, No 5, p 55-58,

Aug-Sept 1971. 1 tab.

Descriptors: Extra high voltage, Alternating current, \*Electrical conductance, Costs, \*Transmission (Electrical), Polyethylene, Temperature, Cryogenics, Economics, Dielectrics, Reviews. Cryogenics, Economics, Delectrics, Reviews.
Identifiers: Dielectric constant, Pipe-type cables, Waltz Mill Project (Pa), \*Underground transmission lines, \*Electric power losses, \*Electrical insulation, Superconductors, Dielectric properties.

Underground transmission for any great distance is not yet economically feasible. Capacitance losses limit the current-carrying capability of the conductor to a maximum distance of about 26 mi at 345 kv. Available compensating equipment is expensive and requires large areas of costly real estate for installation. The state of the art is reviewed. One solution, a pipe-type cable installa-tion, is discussed. A research program on underground transmission, sponsored by the Electric Research Council, is outlined; initial research results are evaluated. More research is needed before simple, reliable, and economic transmission of great blocks of power over long distances underground becomes a reality. (USBR) W72-05292

TRENDS ESTABLISHED FROM 20 YEARS OF PUMPED STORAGE-AND FOR THE FUTURE, Acres Consulting Servies Ltd., Toronto, Canada.

J. G. Warnock.
Paper, International Conference on Pumped Storage Development and Environmental Effects, Milwaukee, Wis, Sept 1971. 40 p, 23 plate, 1 tab.

Descriptors: \*Pumped storage, \*Pump turbines, \*Hydraulic machinery, Underground power-plants, Installed capacity, Environmental effects, plants, Installed capacity, Environmental effects, Hydroelectric power, Thermal powerplants, Forecasting, Peak loads (Electric), Axial flow turbines, Standby power, Ecology. Identifiers: Canada, Reversible turbines, Deriaz

pump turbine, Francis turbines, Specific speed, High head.

Pumped storage has become a significant element of electric power systems of the 1970's. The benefits of relatively simple, highly reliable, promptly available capacity offered by pumped storage are being recognized by electric utilities.

Water pumped into storage reservoirs during offpeak periods facilitates steady loading of large thermal generating units and provides additional energy for peak loads. The environmental benefits derived from pumped storage projects are discussed. A review of pumped storage plants since 1950 shows great advancement in the state of the art. The place of pumped storage in the system, pumped storage and plant development, and the future of pumped storage are discussed. Many descriptive charts and curves are included. (USBR) W72-05294

SUPERVISING RESERVOIRS AND CHOOSING THE MOST ECONOMIC SIZE FOR NEW HYDROELECTRIC INSTALLATIONS, Hydro-Quebec, Montreal.
For primary bibliographic entry see Field 04A. W72-05320

### 8D. Soil Mechanics

NEW CONCEPTS IN CONSOLIDATION AND SETTLEMENT ANALYSIS,
Tippetts-Abbett-Mccarthy-Stratton, New York.

J. Lowe, III. Paper, American Society of Civil Engineers Annual Environmental Engineering Meeting, St Louis, Mo, Oct 1971. 59p, 2 illus, 1 tab, 32 chart.

Descriptors: \*Consolidation, Settlement (Struc-Descriptors: "Consolitation, Settlement (Structural), Clays, "Strain rate, Hydrostatic pressure, Strain, Pressure, "Compression curves, Void ratio, "Soil mechanics, Soil analysis, Soil compression tests, Soil water movement, "Soil tests. Identifiers: Secondary consolidation, Terzaghi Lecture, Pore water pressure, Preconsolidation, \*Soil consolidation tests.

For many years, consolidation has been analyzed using a theory developed by Terzaghi, but now several modifications are proposed. A plot of the movement of an actual consolidation sample vs. the logarithm of time can be separated into 3 stages of compression: primary, transitional, and secondary. A similar plot using the Terzaghi Theory shows good agreement in the early portion of compression, but considerable deviation in the later portion. The Terzaghi Theory can be modified by considering variations that occur to the following 3 factors during consolidation: coef-ficient of compressibility, coefficient of permeability, and thickness of sample. Time vs. movement curves plotted using the modified theory closely approximate the conventional consolidation test results in all 3 stages of compression. Void ratio vs. pressure relationships would be better represented by a family of curves using the strain rate as a parameter than by the individual curve generally used. The amount and time rate of compression of layers in the field can be predicted from laboratory tests using the modified con-solidation theory. (USBR)

SLOPE ANALYSIS FOR EXPLOSIVE EXCAVA-TIONS, California Univ., Livermore.

R. H. Gates.

Proceedings, 13th Symposium on Rock Mechanics, Univ Ill, Urbana, Aug-Sept 1971. 26p, 8 fig. 25 ref, append.

Descriptors: \*Soil mechanics, Rock mechanics, Slope stability, Rock properties, Stress-strain "Slope Stability, Rock properties, Stress-strain curves, Cratering, Finite element method, Com-puter applications, Poison ratio, "Craters, "Rock excavation, Excavation, Fractures (Geology), Bibliographies, Rubble, Slopes. Identifiers: Progressive failures, "Explosive ex-cavation, "Rapid excavation.

Crater slope stability assessment requires informa tion on predicted crater geometry, geologic conditions, and material properties at the site, including seepage and weathering characteristics of the materials. An explosive excavation produces 3 categories of material: the rubble zone comprised Ilback and ejecta, the rupture zone, and the intact zone. A numerical technique using a digital computer has been developed to predict the crater geometry. Soil mechanics principles are used to evaluate rubble zone properties; rock mechanics principles to evaluate the rupture and intact zone properties. Stability analyses of a crater are of 3 types: (1) empirical, (2) limit equilibrium, and (3) continuum mechanics. Empirical analysis slope stability predictions are based largely on the observed performance of comparable slopes. Limit equilibrium analyses are accomplished using the method of slices or the method wedges. To avoid the upper-bound theory of limit equilibrium analysis, a form of stress analysis of the continuum such as the finite element method, is required. Efforts to improve the ability of the finite element stress state, (2) the jointed rock properties, and (3) the stress-strain properties of the material. (USBR)
W72-05284 method to model craters include: (1) the initial

THE DESIGN AND CONSTRUCTION OF BOUGH BEECH RESERVOIR (THE EAST SUR-

REY WATER COMPANY),
Rofe, Kennard and Lapworth, London (England).
P. S. Hallas, and A. R. Titford.

Journal of the Institution of Water Engineers, Vol 25, No 6, p 293-322, Aug 1971. 11 fig, 10 ref, 2 ap-

Descriptors: \*Earth dams, Construction, \*Reservoirs, "Pumped storage, Overflow, Embank-ments, Clays, Compaction equipment, "Pile foun-dations, Tunnels, Construction practices, Dams, Flood damage, Settlement (Structural), Drainage, Identifiers: Great Britain, Site selection, Differential settlement, Pore water pressure.

A 46% increase in reservoir capacity was achieved by constructing an earth dam that curved away from the reservoir. The bulk of the dam is exfrom the reservoir. The bulk of the dam is ex-pected to prevent any clay stretching that might cause transverse cracking. Maximum dam height is 75 ft and crest length is about 4,000 ft. The clay was compacted to 95% of Proctor density in the embankment core and shoulders. To avoid high pore water pressure development, drainage blan-kets were placed in the upstream and downstream shoulders. The drainage blankets are 1-ft-thick sand layers spaced every 7 ft and sloped at 1 vertical to 30 horizontal. Prior to the embankment construction, the lower parts of the valve tower and glory hole overflow and their tunnels were con-structed. Records taken in the tunnels indicated the foundation settled 12.6 in. below the crest, 9.2 in. at the overflow, and 3.8 in. at the valve tower. The large differential settlements resulted because the valve tower and overflow were constructed on pile foundations. In the future, use of pile foundations will be avoided. (USBR) W72-05289

HYDROLOGICAL, HYDRAULIC, SOIL MECHANICAL AND METEOROLOGICAL ASPECTS OF MODELS DEVISED FOR DETER-MINING THE DEGREE OF PROTECTION OF-FERED BY FLOOD LEVEES, National Water Authority, Budapest (Hungary). For primary bibliographic entry see Field 02A. W72-05332

### 8E. Rock Mechanics and Geology

SLOPE ANALYSIS FOR EXPLOSIVE EXCAVA-TIONS, California Univ., Livermore.

For primary bibliographic entry see Field 08D. W72-05284

### Field 08-ENGINEERING WORKS

### Group 8E-Rock Mechanics and Geology

SOURCES OF ERRORS IN ROCK MECHANICS FIELD MEASUREMENTS, AND RELATED SOLUTIONS,

California Univ., Berkeley.

F. E. Heuze.

International Journal of Rock Mechanics and Mining Science, Vol 8, No 4, p 297-310, July 1971. 11 fig. 23 ref.

Descriptors: Bibliographies, \*Rock mechanics, \*Field investigations, Field data, Borcholes, \*Rock properties, Deformation, Stress relieving, Stress, Laboratory tests, Strength, Tunnels, Seismic waves, Rock excavation, Rock tests. Identifiers: Jacks (Mechanical), \*In situ tests, Flat jack method, Modulus of elasticity.

Rock mechanics field measurements are becoming more important in the design of structures in or upon rock. Measurements must be properly recorded and interpreted to accurately appraise the behavior of rock masses. Significant behavioral factors to be investigated include: (1) in situ stresses, (2) quality, strength and deformability and, (3) deformation upon excavation. Borehole jacks and dilatometers are better than overcoring methods for determining in situ stresses. A classification system for describing rock quality should accommodate a number of rock types, be capable of numerical expression, and be easy to use. Generally, these requirements are incompatible. In situ rock strength tests should be of reasonable size and cause minimum test site damage. Rock deformations caused by borehole jacks are affected by the borehole roughness and the inability of jointed rock masses to sustain the high tensile stresses induced by the jack. Seismic traverses are appropriate for delineating gross features of rock bodies, but should be used cautiously for rock mass deformability determinations. Deformation readings are needed to determine rock mass response to excavation. (USBR) W72-05293

### 8G. Materials

OPTIMIZATION OF STAINLESS STEELS FOR USE AS CONDENSER TUBES,

Westinghouse Electric Corp., Pittsburgh, Pa. N. Pessall, and J. Nurminen.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$1.00. Office of Saline Water Research and Development Progress Report No 741, February 1972. 89 p, 53 fig, 12 tab, 8 ref. 14-30-2708.

Descriptors: \*Desalination, \*Metallurgy, \*Stainless steel, Electrochemistry, Deaeration, Condensers, Testing, Corrosion, Mechanical properties, Tubes.

Identifiers: Test coupons, Ferritic stainless steels, Chromium substitution, Molybdenum.

Laboratory studies of ferritic stainless steels based on ternary alloys of Fe-Cr-Mo have been made as a first step towards optimization of their composition, melting procedure, fabrication and heat treatment, for use as condenser tube material in desalination plants. The preparation and characterization of test coupons, representing eight compositions which exhibit a wide range of corrosion resistance, are described. Electrochemical methods have been used to determine the relative corrosion resistances of the alloys and the data correlated with direct immersion tests in ferric chloride and synthetic seawater. This class of material offers both excellent resistance to corrosion in hot seawater and adequate mechanical properties for fabrication into tubing. The final selection of any specific ferritic stainless steel, however, will have to be based on the degree of oxygen control maintained in the desalination plant and the correlation between electrochemical test methods and direct exposure of the test coupons

to desalination plant conditions. (OSW abstract) W72-05740

### 8H. Rapid Excavation

SLOPE ANALYSIS FOR EXPLOSIVE EXCAVA-

California Univ., Livermore.

For primary bibliographic entry see Field 08D. W72-05284

### 81. Fisheries Engineering

LENS PROTEIN POLYMORPHISMS IN HATCHERY AND NATURAL POPULATIONS OF BROOK TROUT, SALVELINUS FON-

TINALIS (MITCHILL),
Pennsylvania State Univ., Erie. Dept. of Biology.
Larry R. Eckroat.

Trans Am Fish Soc. 100 (3): 527-536. 1971. Illus.

Maps.
Identifiers: Brook, Frequency, Gene, Hatchery

Identifiers: Brook, Frequency, Gene, Hatchery, Lens, Natural, Polymorphisms, Populations, Protein, Salvelinus-Fontinalis, Trout.

Lens protein phenotype and allele frequencies of three autosomal loci were analyzed by acrylamide gel electrophoresis for 1,164 specimens from four hatchery populations of S. fontinalis (Mitchill), each representing combined progenies from random matings of hundreds of parents. A deficiency of heterozygous genotypes at 1 locus, according to Hardy-Weinberg analysis, may indicate a degree in inbreeding in the hatchery environment. Allele frequencies of the lens protein variations appeared to be relatively stable from year to year within a particular hatchery. Gene frequency analyses for the lens protein variations disclosed that brook trout populations from some of the different hatcheries were distinguishable from each other. Analyses of the lens proteins for 547 specimens from 9 natural populations of brook trout revealed no genetic divergence in these small isolated populations. A length-frequency analysis of 1 population indicated that allele frequencies were independent of length classes. Evidence was presented suggesting that a distance greater than 300 yards may act as an isolating mechanism leading to genetic divergence of a brook trout population in 1 small stream. Gene frequency analyses for the lens protein variations disclosed that some of the brook trout natural populations from different areas sampled were distinguishable from each other .-- Copyright 1971, Biological Abstracts, Inc. W72-05667

#### WORLD DISTRIBUTION OF RAINBOW TROUT (SALMO GAIRDNERI), Guelph Univ. (Ontario).

Hugh R. MacCrimmon.

J Fish Res Bd Can. 28 (5): 663-704. 1971. Maps. Identifiers: Distribution, Grounds, Rainbow, Salmo-Gairdneri, Spawning, Trout, World.

Since 1874, the endemic range, S. gairdneri Richardson, has been extended through introduction to include eastern North America and the continents of Africa, Asia, Australia, Europe, and South America. The present range of the species extends into low latitudes by the use of waters at high elevations to over 4500 m above sea level. Environmental factors considered to be of primary importance in the survival of introduced populations are water temperature and precipitation. The presence of suitable spawning grounds, coupled with seasonal water temperatures below 13 C, are essential for the establishment of self-sustaining

populations. A further extension of the world range of rainbow trout seems unlikely except perhaps in northeastern Asia. However, distribution within the present range is likely to be increased through the use of new ponds and reservoirs as they are constructed for water supply and flood control by many countries throughout the world. The farming of rainbow trout, now of local significance in parts of eastern Asia, western North America, and central and western Europe, offers an unrealized potential on all continents if warranted by a protein and market demand.—Copyright 1971, Biological Abstracts, Inc.

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MANAGEMENT OF THE OWENS PUPFISH CYPRINODON RADIOSUS IN MONO COUNTY, CALIFORNIA.

Michigan Univ., Ann Arbor. Museum of Zoology. Robert Rush Miller, and Edwin P. Pister. Trans Am Fish Soc. 100 (3): 502-509. 1971. Illus. Identifiers: California, County, Cyprinodon-Radiosus, Management, Owens, Pupfish.

The Owens pupfish, C. radiosus Miller, is restricted to Owens Valley along the eastern base of the Sierra Nevada Range of California. When it was described in 1948 it was thought to be extinct. Its depletion, rediscovery, and reestablishment in the Owens Valley Native Fish Sanctuary, a cooperative undertaking between the City of Los Angeles and the California Department of Fish and Game, are described. Two other refuges in Owens Valley are completed or under construction, and the 3 additional native fishes of this valley will be established in one of these. Such conservation activity reflects the growing concern of the scientific community and the public over the threat to native fishes.—Copyright 1971, Biological Abstracts, Inc. W72-05704

### 09. MANPOWER, GRANTS AND FACILITIES

### 9A. Education (Extramural)

WATER RESOURCE PROBLEMS AND RESEARCH NEEDS OF NORTH CAROLINA, North Carolina Water Resources Research Inst., Raleigh. For primary bibliographic entry see Field 06B. W72-05870

## 10. SCIENTIFIC AND TECHNICAL INFORMATION

DIELDRIN IN WATER - A BIBLIOGRAPHY.
Office of Water Resources Research, Washington,
D.C. Water Resources Scientific Information
Center.
For primary bibliographic entry see Field 05B.
W72-05325

POLLUTION OF GROUNDWATER DUE TO MUNICIPAL DUMPS,

Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch. For primary bibliographic entry see Field 05B. W72-05651

THE ECONOMICS OF WATER-BASED OUT-DOOR RECREATION: A SURVEY AND CRITIQUE OF RECENT DEVELOPMENTS, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 06B. W72-0566

AGRICULTURAL RUNOFF - A BIBLIOG-RAPHY.

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A. Centers of Competence		
Cornell University, Policy Models for Water Resources Systems	W7 2-05320 05324	5
Bureau of Reclamation, Engineering Works	W7 2-0 528 1 0 529 4	14
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W72-05417 05419 05428 05432 05433 05435 05444 05583 05594 05596 05597 05599 05614 05616 05621	60
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University of Florida, Eastern U. S. Water Law	W7 2-05509 05510 05515 05532 05535 05554 05742 05786	85
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University of Wisconsin, Water Resources Economics	W7 2-0 56 59 0 56 66 0 56 68 0 56 7 5	16
lowa State University, Agricultural Livestock Wastes	W7 2-0 5680 0 568 5 0 58 11 0 58 37	33
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B. 5	State Water Resources Research Institutes		
1	New Jersey Water Resources Research Institute	W7 2-0 5326, 0587 1	2
(	Oregon Water Resources Research Institute	W7 2-05533	1
1	New Mexico Water Resources Research Institute	W72-05687	1
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	Engineering Aspects of Urban Water Resources (Poertner)	W7 2-0 579 3 0 580 1	9
	Environmental Protection Agency	W7 2-0 58 38	1

### CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

### Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

## **Subject Fields**

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- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
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